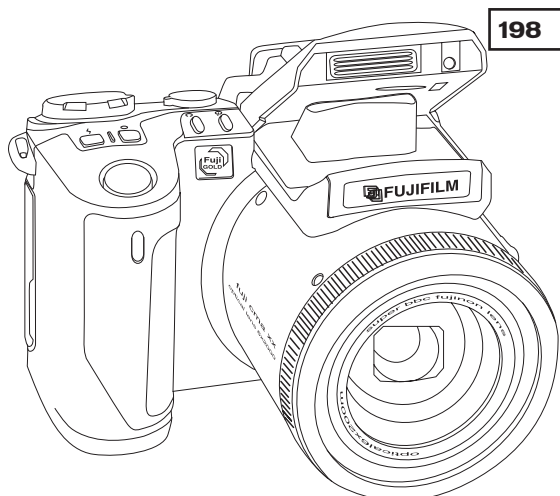




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The Internet has become so integral to all our lives that we almost can't survive without it

Cut off in my prime



Last month I talked about my early experiences with ADSL and how amazing it was to have a high-speed always-on connection at home. This month I thought I'd continue on the same theme, but things aren't looking quite so rosy any

more. For the past five days I've been without Internet access at home since BT OpenWorld has been having major problems with its service. I know this because when I phone the information line I'm told that 'BT OpenWorld is having major connection problems', and that's it.

However, since I'm a journalist I have access to a few other numbers, and after talking to someone who wasn't a recording and knew what they were talking about, I discovered that there was a problem involving IP address allocation. I was, however, also told that a patch was about to be installed and the service would be resumed very soon. Unfortunately that was three days ago and I've still got no service.

It is, of course, easy for me to rant and rave about how disgusting this situation is and to demand to know why more thorough testing wasn't performed before the service was opened to the public. However, I've done enough system configuration and debugging in my time to know that sometimes the only way to truly debug a system is to go live and see if it works. But even with this knowledge I still can't help getting more and more frustrated with my lack of Internet access at home and it's this frustration that has made me realise that the Internet has become an integral part of my life that I can no longer do without.

Up to this point I had always seen the Internet as something that's a useful tool but I would have never imagined that my life would become considerably more difficult and less enjoyable without it.

The first hurdle I encountered was that I could not retrieve some email that I had sent to myself at home from the office. This included some important data that I needed for a review that I had intended to write that evening. Although it may seem short sighted now, I had already removed all trace of dial-up connection from my

PC, so I didn't even have a modem with which to contact the outside world.

After the initial anger had subsided I decided to take this as a sign that I shouldn't be working in my free time, so I fired up Half Life for bit of counter-terrorism, but of course this was also out of the question without my trusty ADSL link.

Over the next few days I realised just how subconsciously dependent I had become on the Internet. The phrase 'I'll just check online' had become such a common part of my vocabulary that I only noticed how often I said it when I no longer had the means to do so. It had become second nature to me to fire up a browser window and check out a company's website when I saw an advert that interested me in a magazine. It had become just as natural for me to use the web as a means of research for a potential purchase. Just a couple of days ago I had decided to buy a new TV, but all my usual

The phrase **'I'LL JUST CHECK ONLINE'** had become part of my vocabulary that I only noticed how often I said it when I could no longer do it

sources for critical review and retail outlets are online, so I've had to put my purchase on hold.

Even my very existence was at risk since I couldn't order my shopping from Tesco's website (I know it's really sad but my wife and I are very busy people, honest). Now I know I could have actually driven to Tesco and done my shopping in the traditional way, but once you've discovered that you don't ever have to visit a supermarket again you never want to go back.

So if you've been very cynical about the Internet being lauded as the last great life-changing invention of the previous millennium, you might want to take a close look at your life and see how much of it involves Internet access in one form or another.

A week ago I would never have believed that I relied so much on connection to the Internet, but now that I've had to suffer without it for even this short time I've come to realise that I've been taking the Internet for granted for a very long time.

Riyad Emeran, Editor in Chief

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Original design WB Associés, Paris
Origination Westside Digital Media,
32 Great Pulteney Street, London W1R 3DE
Printed St Ives plc, Plymouth
Distributed Marketforce (UK) Ltd,
247 Tottenham Court Road, London W1P 0AU

 **vnu business publications**



133,361
Jan-July 2000

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GAMES

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Topping the bill this month is BodyWorks 6. It's new, improved and huge... yet we still managed to squeeze onto the disc a fully featured personal finance package, Personal Accounts 4. It's comprehensive, capable, yet so easy

to use that you'll have it running your finances in no time. There's also Morpher for Windows, a superb program that gives a fascinating insight into the world of morphing. Great for creating animated gifs for your website.

BodyWorks 6

FULL VERSION

BodyWorks is an interactive information system designed to help you explore the world of anatomy. Anatomical concepts are illustrated in text and pictures. BodyWorks lets you navigate from one item to another, and from one system to another, in any order.

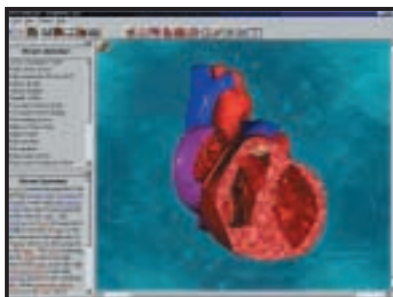
What's new?

There's all the content from previous versions, as well as all-new material. Individual sections of the program are greatly expanded. There are also new sections for medical terminology, aging, reproduction, plus new muscle/nerve descriptions and listings of origin, and insertion points for muscles.

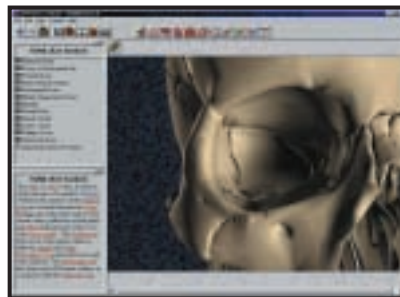
Flexible interface

Certainly the biggest change in this version of BodyWorks is the new interface. Now, all data is consolidated into one convenient interface. The program lets you customise how you view information and gives you much more control over those views.

Each section of the screen can be detached so that it exists in its own window. These windows can be resized, repositioned, made full-screen, and closed. This lets you see a full screen of text for easy reading or a full screen of graphics for more detail. If you move the windows back over the main



Click once on an image for information



Double-click on an image for related screens

screen, they will 'dock' in that new location. The program also has several new toolbars that behave in the same way. This lets you organise your own learning environment.

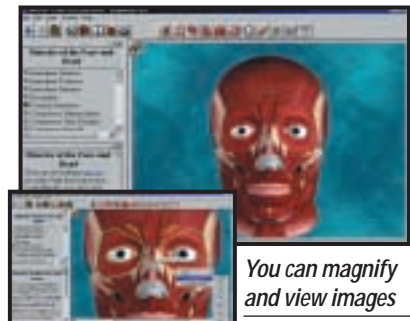
3D models

One of the most popular features of BodyWorks is the 3D models. In this version, the publisher has expanded the number of models included and enhanced the way they work. You can now get more information directly from the models.

When you move your mouse over the images, individual parts of the model will become highlighted and an identification tag will appear. Clicking once will display information about that part in the topic and text windows. Double-clicking will take you to any screens related to that part.

You can also control the models directly. If you click and drag your mouse over the image, you can spin the model around. Most models can be rotated horizontally, and many can be rotated in all directions. There are also images where rotations won't make sense, so these pictures are fixed.

Also new is a Picture Magnification function to let you view the models at different sizes. Your view can range from 0.25x to 3x magnification. To make it easier to access this function, we've included a



You can magnify and view images

Magnification toolbar to let you set the magnification level directly.

Dr BodyWorks

Dr BodyWorks has become a very popular feature in BodyWorks. There's a new virtual classroom environment and an additional



Listen to lectures in the virtual classrooms

five multimedia lectures. This means the program includes approximately 45 minutes of multimedia lectures. The new sections cover the five senses in detail.

The Dr BodyWorks movies are multimedia lectures covering different topics in anatomy. These lectures, conducted by Dr BodyWorks, include computer-generated 3D images that illustrate the points of the lesson. The lessons range in length, anywhere from one to four minutes.

BodyWorks 6 (continued)

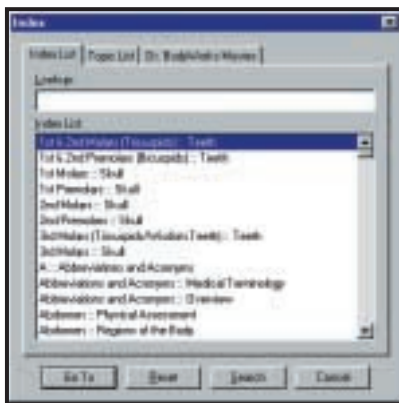
FULL VERSION

The Dr BodyWorks movies can be accessed from the Links menu in the upper-left corner of the graphic window, or from the Dr BodyWorks item under the Content menu. VCR-style controls at the bottom of the main screen let you control the playback of the lecture movies.

Layouts

This version of BodyWorks has been redesigned from the ground up especially to enhance the way you interact with the program. The new interface lets you customise almost every aspect of the way you view information. You can save these configurations as individual layouts that you can call up later. This lets you quickly switch between your favourite views. If more than one person uses the program they can select different views.

If you change the layout, you'll be asked to save it when you quit the program. You can also manually save the layout with the Save Layout function in the File menu. You can control how layouts are saved in the Options screen in the Edit menu. The saved layouts can be selected from the Layout option in the View menu. You can also use the Layout toolbar to get immediate access. The program comes with a default layout that you see the first time you run the program.



Hyperlinks provide word definitions

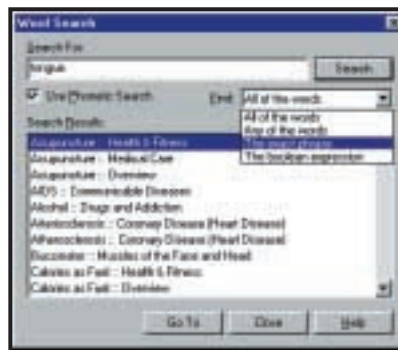
Hypertext

When reading the text entries for the various items in BodyWorks, you'll notice that some words are highlighted. These are hypertext entries. If you click on these you'll be given a definition of the word from the glossary or a choice of other screens that will give you more information.

Clicking on the Internet URL links in the program will launch your default web browser so you can view up-to-the-minute information directly from the source.

Word search

Previous versions of BodyWorks had a sophisticated index system to help you find information in the program. In this version, that capability has been expanded to let you find any word, anywhere, in the complete



Search for any word, anywhere in the text

text of the program. This gives you tremendous capabilities for research.

You can access the word search function with the Search All Text option in the Content menu and in the Command toolbar. Here, you can type a word and search for it. There are several options available at this point.

- **Phonetic Search** This search is based on how the word sounds rather than its exact spelling.
- **All of the words** This option means that all the words you've typed need to be in the results returned.
- **Any of the words** Entries are displayed if they contain any of the words you've typed. Not all the words need to match.
- **The exact phrase** This treats the words you've typed as a complete phrase rather than a set of keywords, for example, 'These are the times' rather than 'these', 'are', 'the', and 'times'.
- **The Boolean expression** This lets you create an advanced search using the control words AND, OR, and NOT. The search reads from left to right and a control word only affects the word that immediately follows it. An example is: 'heart and artery not vein'. This finds any entry that contain the words 'heart' and 'artery', but does not include the word 'vein'.

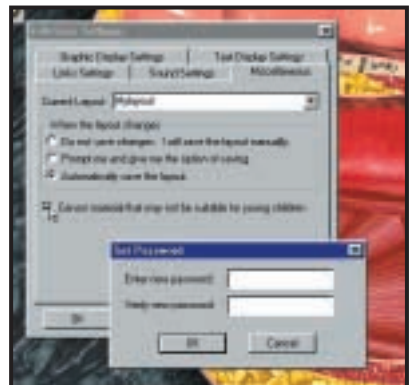
Once the search is complete the results will appear in the window. At this point you can select an item from the list and press the Go To button to go to that screen.

Toolbars

Toolbars are one of the biggest additions to the new interface for this version of

BodyWorks. They give you immediate access to common functions. Like other parts of the interface, the toolbars are 'dockable'. This means that you can click on them and drag them to new positions on the screen. They can be independent windows, or you can 'stick' them to a new location in the main window. This allows you great freedom in customising the way the program looks. The different toolbars can be turned on and off in the View menu. Here's a quick overview of the toolbars and what they do.

- **Layout Bar** Lets you choose from different layouts for how the interface is set up.
- **Command Toolbar** These are common program functions such as print, index, glossary, etc.
- **Topic Toolbar** The buttons here represent the different systems of the body and let you jump to them directly. They include things like the Skeletal system, Muscular, Nervous, etc. These systems can also be accessed from the Content menu.
- **Status Bar** This gives you messages about the modes you're using and descriptions for what the different tools do.
- **Magnification Bar** You can zoom in and out of the graphic window. This lets you set the magnification level.
- **Bookmark Bar** You can add a bookmark for the current screen and return to previously saved selections.



Password-protected censorship is available

Censorship functions

For parents concerned about what their children are learning, there's a new censorship function that limits access to certain functions of the program. This function can be turned on or off in the Options screen in the Edit menu. If censorship has been turned on, you'll need a password to turn it off.

Personal Accounts 4

FULL VERSION

Personal Accounts 4 opens with the words 'Maximum output, Minimum effort, Wizards not required' – believe it! Accountz.com has produced an intuitive personal accounts program. We've a full version for you this month, plus a trial of the latest Version 5.

Keeping it simple

Need to know what your bank balance will look like at the end of the month? Simple – it's always on view! And double-click on that balance and you'll get a full breakdown. It tells you if you're about to become overdrawn, on what date, and by how much.

No other accounting software achieves so much, so easily, with such a simple and elegant interface – just one window (called Entries) handles *all* your day-to-day transactions. Another window (Accounts) is used to display the results. Just switch on your PC, enter your transactions (in any

order) in the Entries window, and view the Accounts window.

To start the program, click the RUN button. Or, you can install by clicking the INSTALL button and following the on-screen instructions (we suggest you stick with the default setting and save the program to your desktop).

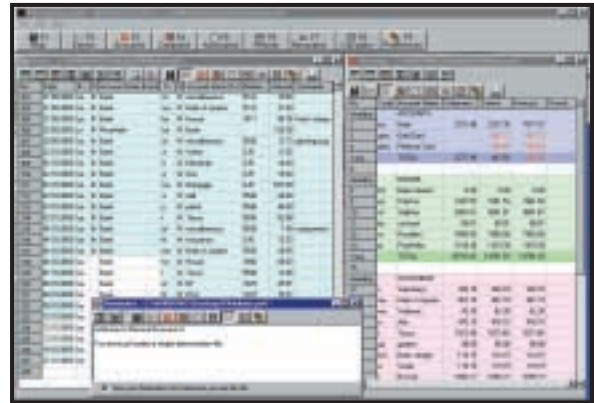
You'll be asked to log on to the Accountz.com web site to get your PCW FREE registration code.

To use the program at its most basic level, just select Accounts (F3) from the toolbar (which appears at the top of the screen). Enter your account names, such as your bank account, credit cards, payment headings (eg 'petrol', 'food') and give each account a shortcut code in the field to the left of the name.

Now open the Entries window (F2) and type in your transactions. An entry can come 'From' any account and go 'To' any other. A single window handles the lot and that includes transfers. If you need any help, press F1 at any time in any window.

Sample files and trial version 5

The 'PA4demo' file (in the same folder as Personal Accounts) is well worth a look. Double-click on the icon to load it, then



Use the shortcuts to call up your accounts with minimum effort

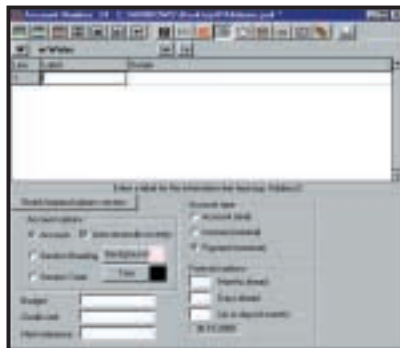
double-click on any of the balance fields in the Accounts window to produce a report. The same applies to the Entries window where you can double-click on just about any field for a relevant report.

Reconciling an account is easy too – press Ctrl & R to open the reconcile toolbar in the Entries window. Select an account from the dropdown list. Enter the 'target' balance, click 'Auto' and all the relevant entries are reconciled automatically.

This program really does grow on you. The more you use it, the more you discover. It first appeared on the RISCOS platform and has a large following of devoted fans.

Accountz.com recently released Version 5 of Personal Accounts. This has many new features. Try out the trial Version 5.

Read all about it (and upgrade at a reduced price) by visiting www.accountz.com.



Click on your account to see your balance

Using the cover disc

The PCW cover disc uses a web-browser-style interface. As well as cutting the time needed for development, content designed for the web can be easily ported to the disc (and vice versa).

Compatibility issues are reduced as your browser has been installed to work on your individual PC. However, to get full functionality from it, you'll need to use Microsoft Internet Explorer (version 4 or later). This is because we use a special ActiveX plug-in that allows us to install software directly from the browser, without all the usual options, dialogs and security warnings.

Unfortunately, Netscape doesn't properly support this software. For non-Microsoft users, we've included a small installer that will run when you insert the disc, or when you run the program PCW.EXE in the root of the disc. Of course, you can still launch the main browser to read all about the software on this month's disc.



IMPORTANT

Please note that we cannot give support on individual programs contained on this disc. Should you have problems running the disc or any of its content, please note the following guidelines:

- Faulty disc (ie, the disc is physically damaged and will not load) – return the disc for a replacement to: PCW January cover disc, TIB plc, HelpLine Returns, Unit 5, Triangle Business Park, Pentrebach, Merthyr Tydfil, Mid Glamorgan CF48 4YB, quoting ref 'PCW Vol 24 No 1'
- You have problems installing/running the software. Check the support page on the CD, or the support website at www.pcw.vnuet.com/cd. You should also check the manufacturer's website
- For general difficulties call 01685 354726
- If you're still stuck, drop us an email at pcwcd@vnu.co.uk – we may be able to help.

Morpher for Windows

Morpher makes digital movies using a 2D morph between two still images. Morphing is the process of transforming one image smoothly into another – a bit like in the movie *Terminator 2*, but much simpler. You need two identically-sized images. Define which points on the first image will correspond to points on the destination image. These are known as nodes. Morpher makes the process very straightforward, and even provides two sets of sample images for you to practice with.

Getting started

So what does morphing involve? Try it out with the following guide, which shows you how to:

- Prepare two images and import them into Morpher.
- Set up corresponding points on the two images.
- Create boundary lines between points.
- Set image transform parameters.
- Start rendering.

Prepare the images

Choose two still images to be used as first and last frames. The image format must be jpeg, gif or bmp. For best results they should be full-colour images (24bit). If you prepare three or more images, you can create a movie that morphs between each in sequence.

Importing images

Start Morpher and select the New command from the File menu to create a new document. This document (called the workset), contains images of the first and last frames as well as point and boundary information. An empty split window will open (left area for the first frame and right area for the last frame).

Select the Import Image... command from the File menu to import each image from disk into the current frame. If the image data was previously copied to the clipboard, you can use the Paste command. You will need to import two images. If one of the imported images is larger than the workset size, it will be automatically cropped.

Note: you can drag an image and its points to an adjusted position. Holding down the Shift key and dragging moves only the image (not the points).

If you want to use three or more images, select the Insert frame command from the Frame menu – the new frame will appear before the current frame.

Editing points

These are points that correspond on the two images. It's best to position your points on the edges of any shapes in your image.

- Select the Edit point mode command from the Mode menu.
- Double-click within your image to make a point. Points are indicated by green and red rectangles. After selecting a point, the rectangle changes to blue and yellow.
- Each point created in one image creates a corresponding point in the other image. You can then drag each into the desired position. To delete a point, select it then choose Delete from the Edit menu.



From left to right: Editing points; editing boundaries; rendering; and the end result

A boundary is a line that joins two or more edit points. Boundaries are better suited to the edges of shapes to be morphed.

- Select Edit boundary mode from the Mode menu.
- Click the first point that is to form the boundary. The mouse cursor will change.
- Click on another point to form a boundary. Boundaries are indicated by magenta line. A selected boundary is indicated by cyan line.

To select a boundary, double-click near to the line. To delete a boundary, select Delete from the Edit menu.

Rendering

Select the Rendering option command from the Mode menu to open rendering options dialog. Select the rendering method and number of frames.

Note: Morphing creates a standard morphing effect. Warping does not transform colours – only the image shapes. Warping is a useful way to change, say, facial expressions on a single photographic image.

After all your points and boundaries are set you can begin rendering. Select Start rendering from the Mode menu to open the rendering dialog.

Action – select whether to make a movie or just preview. You can preview a

single image before making the movie if you want to work out how long the entire movie will take to process.

Rendering quality – rendering images can be CPU-intensive. High-quality rendering works very slowly.

Select movie format – avi, gif animation, or still image files (bmp or jpeg). Make forward and back stream – if this is selected, the movie will morph from the left to the right image and back again.

Effective morphing

Select your source and destination images carefully:

- A photograph is better than a drawing.
- Solid colour background works well.
- High colour or True colour is preferable to an index colour picture.

Position your points carefully

Morphing changes both colours and shapes within your image. It changes colours automatically, but you control how the shape change information is input. Refer to the sample files in the Morpher folder before you start morphing your own images.

Pay special attention to the key points and boundaries of an image:

- The edge of object. If you want to morph two faces, the key points are the edge of face, hairline, etc.
- The points that convey the subject's personality. If you want to morph two faces, you must carefully position your points on the eyes, mouth and nose.
- Remember that boundaries should be used on the edge of shapes and the outline of the image.

Visit www.asahi-net.or.jp/~FX6M-FJMY/mop00e.html for more information about Morpher plus the latest updates.

Minimum system requirements

Windows95, NT4 or later, Internet Explorer4.0 or later. **Note:** Morpher3.0 is a Java application and it runs under the Java Virtual Machine.

IE4.0 includes MS-Java Virtual Machine. But the latest version of this can be downloaded from www.microsoft.com/java.

What's on the DVD

(applies to DVD edition only)

Encyclopedia of Great Literature

Topping the bill on this month's DVD is this encyclopaedia, which includes 1,770 works of literature from 205 best known authors from around the world

You'll find works from Lord Byron, Lewis Carroll, Charles Darwin, Arthur Conan Doyle, Rudyard Kipling and John Milton, to name just a few. To give you an idea of the scale of this encyclopaedia, there are 43 works from William Shakespeare alone!

View over 300 illustrations from books such as *Alice in Wonderland*, *Journey to the Centre of the Earth*, *Pinocchio*, *King Solomon's Mines*, *Origin of Species*, *Tess of the D'Urbervilles*, and *Tom Sawyer*. A necessity for every cultured household, this comprehensive reference work will provide education and entertainment for the whole family.

NEW Linux Mandrake 7.2 (release candidate)

Linux Mandrake is a complete pre-configured graphical Linux OS. It's easy to install, easy to use and stable. We featured version 7.1 on October's DVD. It has proved to be the most stable and easy-to-use Linux we've ever got our hands on. Now we bring you the very latest version 7.2. It's the release candidate, although MandrakeSoft assures us it is stable and unlikely to change at all when it ships commercially.

The installation on this DVD is supplied in the form of two ISO-9660 image files. You'll need to burn these onto CD-R discs before installing (CD writer required). You'll find plenty of installation information on the DVD.

TurboLinux Workstation 6

Here's your chance to try out TurboLinux Workstation 6. TurboLinux is the market leader in Asia and is fast extending its reach worldwide. TurboLinux has some of the

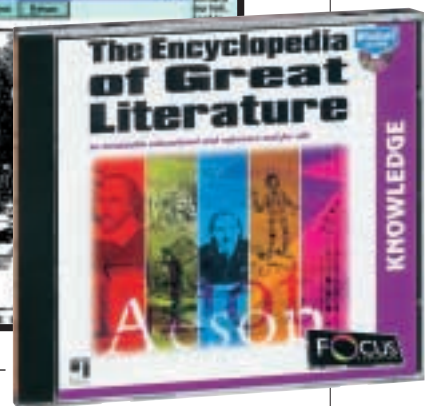
IMPORTANT NOTICE

The first time you run the Encyclopedia, you will be asked for the drive letter of your DVD-ROM drive. If you input the wrong letter, you will have to delete the file LOTF.SET (in your Windows folder) then run the program again.

You should NOT install either version of Linux unless you are fully confident that you have understood the instructions. You are installing this software at your own risk. Neither the software publishers nor VNU can accept any responsibility for any damage or loss of data. You will find FAQ files on the DVD and at the publishers' websites, however, no direct support can be given.



Search for anything from *Wonderland* to Shakespeare



most significant Linux reference sites in the world, including JP Morgan (super-computing for market models), Sanyo (world's largest enterprise Linux deployment), and Kyoto Sangyo University (IBM's largest Linux server site).

Ulead Photo Library

Ulead Systems' Stock Photo Collection 1 is a collection of 769 royalty-free stock photos for your personal use. These images are in jpeg format, and are ideal for brightening up your website or other screen-based presentations. The library covers a wide

range of photo categories, including animals, architecture, art, flowers, food, landscape, music, nature, people, plant, sport, and transportation. Use any image browser, or Ulead's own PhotoExplorer to view and organise your collection. The images are in the folder:
 \software\ulead_photocollection.

Ulead PhotoExplorer

Get photos from digital cameras and memory card readers automatically with the Digital Camera Wizard. Organise and make image adjustments to them. You can display photos full size and step through photo collections; print thumbnail indexes or full-sized prints. You can also share photos on the web in one step via iMira.com; just drag them onto the Drop Spot. View photos in a slide show, send them via email or export them to web pages. Create colour reprints in a wide range of sizes on your colour printer. Colourful toolbars and thumbnail images



Photo Explorer lets you organise and display your photos

PCW COVER DISCS BROUGHT TO YOU IN ASSOCIATION WITH:



What's on the DVD (continued)

make using program functions easy. Visually browse through many file types.

This banner-ad version of Photo Explorer 6.0 is fully functioning, free software. It never expires. Users also get a free account on iMira.com, Ulead's photo sharing and services website. For support and FAQs, visit: www.ulead.com.

Translation software

In this age of globalisation, fast and accurate machine translation is becoming increasingly vital to everyday business affairs. SYSTRAN has been building translation software for over 30 years. SYSTRAN's machine translation (MT) software translates one natural language, into another natural language. MT takes the grammatical structure of each language into account and uses rules to transfer the meaning and the grammatical structure of the original (Source) text into the translated (Target) text. We've included the English/German module to give you a taste of just what SYSTRAN is capable of. There's also a very special reader offer.

Queen Greatest Hits demo

Part of the Interactive Songbook series, learn to play piano and chord sequences from Queen's greatest hits. This sample takes you through riffs and chords from *Now I'm Here*. Don't worry about complicated musical scores, there are none.



Learn to play Freddie's greatest hits

INVU FileServant

INVU FileServant information and document manager (trial) is designed to manage all applications and information on the desktop. Most users want a simple way of calling up their favourite applications such as Microsoft Word or Excel, scan in paper documents and then manage all the data received or produced for instant access in the future.

INVU supports any windows application. Therefore, whether you produce letters, spreadsheets, technical documents and drawings, designs or any other type of document, INVU manages this information for you.

Games

RealMyst

If you remember Myst the first time around, you may be asking yourself what this is all about. Well it's RealMyst because the beautiful looking and atmospheric mystery has finally caught up with today's sophisticated first-person graphics engines to present the adventure in real time and three dimensions. Superb interaction and atmosphere. Check out the demo.

Crimson Skies

In this alternate history, the year is 1937 and the US is fractured into squabbling nation-states, brought about by the weight of the Great Depression, regional prohibition and mounting isolationism. Giant Zeppelins crisscross the skies carrying both passengers and cargo, and airborne bandits are a constant threat. Dogfights, buried treasure, and treachery await you over the South Pacific in two single-player missions.

Dirt Track Racing: Sprint Cars

This game follows on from Ratbag's previous title Dirt Track Racing. The sport is among the most popular motor sports in the US with over 700 tracks, and millions of spectators attending weekly race meetings. DTRSC claims to be the first game to capture the essence of sprint car racing, with their distinctive angled wings and top speeds of up to 170mph.

Breakout

A new spin on Atari's arcade classic. Play two levels in this 3D blockbuster. It's just as addictive as the original.

Insane

Codemasters turns the ignition key on its multi-player all-terrain 4x4 racing game later this year as Insane – the game where dangerous driving is the safest bet – gets into gear on PC. Especially designed for Internet and LAN play, Insane puts players



RealMyst has great interaction and atmosphere in real time

behind the wheel of a range of off-road vehicles. The demo will give you a taste of the real thing.

Metal Gear Solid

The terrorists have got their hands on hundreds of nuclear warheads and are demanding that the government turn over the remains of Big Boss. If their demands are not met within 24 hours, they'll launch a nuclear weapon. You take on the role of retired Special Forces veteran Solid Snake as he is called back to duty in a top-secret mission.

MoneyMad

A kind of insane Monopoly on a global scale. You are one of the 10 richest people in the world. Your fortune and your taste for success have gained you entry to the most select club of the six continents, the Money Mad Club. The goal is to become the richest man, woman, or android on the planet. To get started, you'll need to run the file `\software\moneymad\RunMe.bat`.

Escape from Monkey Island

This features an original cinematic story full of drama, intrigue and humour. There are hundreds of challenging puzzles, set amid richly rendered backgrounds.

Starting the DVD-ROM

The DVD should auto-start, just like the CD. If it doesn't, double-click the DVD-ROM icon in My Computer or, alternatively, run the file `pcw.exe` on the root of the DVD. Check out the support website at www.pcw.vnUNET.com/cd for late-breaking news on the programs on the disc

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Microsoft hack tolls for thee

Mystery still surrounds how hackers managed to get a Trojan – rogue code posing as legitimate – past Microsoft's firewall. It appears that they had access to code in development but did not reach the source code of its current products.

But look to your own PC before you laugh at Microsoft's discomfort. Microsoft is listed as a trusted site on most PCs, which will therefore happily download code from the company.

Anyone who gets behind Microsoft's firewall thus has a potential backdoor into most PCs on the web. As the poet said: 'Think not for whom the bell tolls...'

Broadband price war as ADSL gets a shaky start

BT Openworld's ADSL service got off to a disastrous start as the first signs came of a broadband price war. Users of the home USB product lost their link for more than a week after what BT described as a serious design fault in a server.

A spokesman said: 'The server was failing to allocate some IP addresses and allocating others to more than one user. When it registered that two machines were using the same IP address it shut both down.'

He added: 'It was a volume problem. It only became apparent when lots of people were using the system.'

At least 500 users were hit. 'But it could have been as many as 2,000. The support lines became flooded so many people may not have bothered reporting it.' To cap

it all BT Internet mail servers used by many ADSL clients crashed after being flooded by water. And ADSL newsgroups were swamped with complaints from irate users. BT says they will not be charged for the month.

Many home users were still down after the IP problem was claimed to be fixed. This time there was a problem with cards at an exchange.

The IP bug did not affect business-class links. But, coincidentally, mine crashed at the same time as editor Riyadh Emeran's USB link.

Unlike many USB users, I could get through to the swamped support desk. After eight days, at BT's suggestion, I tried the obvious – resetting the router – and was back online in 30 seconds.

Net2Phone's US strategic development director Bart

Bartolozzi put the problems in perspective. 'All DSL operators have had teething problems,' he said. 'This is a very immature technology but it will get better.'

The message is clear: ADSL is good and is here to stay; but if your business depends on the link, wait a while or make sure you have a fallback.

Broadband offers are becoming more flexible and competitive. In some areas NTL is trialling offers such as £4.99-a-month 64Kbits/sec and £24.99-a-month 512Kbits/sec cable modems – in the latter case you have to pay £149 for the modem. Companies, like Home-Choice, offering cheap lower-bandwidth and wireless deals are becoming more attractive. See page 42 for a four-page special report on broadband.

CLIVE AKASS

Pace brings TV into line with home networks

Pace, Europe's top-selling set-top-box (STB) maker, drifted from the PC world after its early days making modems. Now it is drifting back as the STB becomes a home gateway other devices can link to.

The Gateway Expander (right), its first foray into home networking, uses the cordless phone protocol DECT. In the foreground is the base station; the client device is the thing resembling an ear muff on the rear PC. See more about this on p28.



A still more interesting Pace exhibit at the Broadband 2000 show in London was a Palm Pilot using Bluetooth to link to a TV for viewing web

pages. Pace is not the only company to think that the TV is good for what is called six-foot information, as opposed to the two-foot information on a PC screen.

It's long been my hunch that the mobile will merge with the TV remote control (the Palm could do that too) and cellphone to become a universal access device. Pace's Bill Hoath says the company has been thinking along the same lines. This is clearly a space to watch. CLIVE AKASS www.pace.co.uk

Best idea bar none

Long-time *PCW* readers may recall that the news pages have often bemoaned the neglect of bar scanners as a



way of interfacing the printed page with PCs. At one stage we even considered bundling one with the magazine but prices were too high. However, they are coming down. This keyring PennyScan from IncaScan is selling for just under £10 and can be cheaper still if incorporated into existing products. The vendors say they are on track to sell it for below £7.

As it stands the PennyScan has to be used in conjunction with a base unit but it could be incorporated into a handheld computer to read URLs and other contact information if people are sensible enough to include barcode versions on adverts and business cards. IncaScan 01438 718 007 www.pennyscan.com

Clock this

Here's an idea for what to do with unwanted CDs you have lying around the house. For



£6 including postage you can buy a kit to turn it into a clock. Details are at www.personal-gifts.com

New toll-free offers

It has been a confusing time for people seeking unmetered dial-up access with some service providers beating a retreat while others, including BT, have flagged new offers.

NextCall (www.nextcall.co.uk), which offers cut-price calls on BT lines, has offered 'totally free' web access financed by advertising. The offer is being promoted only in the Leeds area and to existing NextCall subscribers, but it is open to new sign-ups across the country. A spokesman said: 'NextCall is not promoting it nationally until it has the capacity in place.'

BT announced two new access deals on the back of its BT Together offer of

unlimited local voice calls for an extra £5 a month (£11.99 with line rental) from 1 December, subject to regulatory approval. Both are subject to your being signed up with a participating service provider. The offers are:

- BT Surf Together £14.99 a month including line rental for unlimited off-peak web access but standard local voice call rates.
- BT Talk and Surf Together £19.99 a month for unlimited off-peak web access and local voice calls. You can still pay £19.99 a month excluding line rental for unlimited off-peak access any time.

AltaVista, which started the unmetered ball rolling by announcing a service that never materialised, said it had

scrapped all plans to offer unmetered access.

Virgin (www.virgin.net) postponed indefinitely a national rollout of its unmetered offering as it tried to sort out problems with its trial service with 100,000 subscribers. A spokesman said: 'There are a number of areas we need to improve.'

Freeserve (www.freeserve.net) also suspended sign-ups for its Unlimited Freeserve Time offer. According to a message on its website this is 'so that our existing member base receives an improved service'. The company has blamed 'heavy users' for difficulties in getting a connection and slower download speeds.

Web phones promise cheap calls

Hardware products that allow you to use the web for cheap or free voice calls are beginning to hit the UK market as vendors see the beginning of an exploding market.

Voice over IP (VoIP) is becoming increasingly viable, partly because of the introduction of always-on and unmetered services, but also because the technology is improving.

Free PC-to-PC voice calls have been around for years but have been generally poor quality, with appreciable time delays, giving you the impression that you are talking to someone on the moon.

However, VoIP companies like AT&T-backed Net2Phone own or lease trunk routes to give them a measure of control over quality – local links are still the responsibility of the local operator.

They also have gateways across the world that can route IP calls to local dial-up phones, allowing PC-to-phone calls. Several vendors, including AT&T, have demonstrated true Internet phones which pack their own microcomputer and don't need a PC but they have yet to hit the market – probably because it is not yet mature enough.

But Net2Phone has launched a VoIP handset called a YAP (Your Alternative Phone) that connects to your PC via the USB port. It costs £49.99, including up to 350 minutes of free calls – depending on where you are calling. A headset version costs £39.99.

Net2Phone quality is surprisingly good, at least on an ADSL link, but you can try it from any sound-equipped PC by downloading the client from www.net2phone.com. PC-to-PC calls are entirely free and calls to phones are

claimed to be competitive with those routed through cut-price telcos. The initial figure of around 2p a minute for UK calls is hardly earth-shattering.

But check the Net2Phone site for the rates of countries you are most likely to contact, and bear in mind that this is going to be a hot market in which you can expect prices to fall.

ActionTec has released what it calls an Internet Phone Wizard (IPW), either USB or PCI based, which allows you to use a standard handset for either VoIP or ordinary calls. Unlike Net2Phone this is not tied to a particular VoIP provider so you can shop around for the best rates, which may include free calls to some countries; however, the quality is likely to be a lot more variable.

Another advantage of the IPW, in theory at least, is that you can use it with a cordless phone.

Standard floppy packs 32MB

A new superfloppy drive will boost the capacity of a standard 1.44MB floppy to 32MB, according to reports from the Far East.

Matsushita-Kotobuki Electronics will include the technology in a 240MB superfloppy drive it is developing. This itself appears to be an enhancement of the LS120 superfloppy drive which, as its

name implies, takes special 120MB disks as well as standard floppy disks.

It is unclear as we go to press whether this drive will take new disks or pack more tracks on to 120MB disks. But the new technology, called FD32MB, does increase the number of tracks on a 2HD floppy from 80 to 777.

The new drives are said to be sampling now and a USB

version will be available, in the Far East at least, in February.

Lance Quantrell, of storage media-specialist Imation, said he had not heard of the new drives. 'There has been talk of a 260MB (sic) superfloppy but I'm not sure what kind of market they would get for a 32MB floppy.'

He said sales of standard floppy disks are falling and they could be on their way out.

Short stories

SAFER ESHOPPING

Shoppers have seven days to decide whether to keep goods bought over the Internet, under a new European directive. The law also allows you to cancel an order and claim a refund within 30 days – even after goods are sent. You may also claim a refund for goods not dispatched within 30 days. There are exceptions to the rules, including aspects of travel and ticket purchases.

PCWERS ON AIR

If you can't get enough of *PCW*, try tuning to London's LBC radio, 1152AM, on Thursday evenings between 7 and 9pm – or catch the audio stream online at www.lbc.co.uk/lbc.ram. You can catch the latest IT news and views in a *The Lab*, hosted by *PCW* deputy editor Nik Rawlinson and contributing writer Gordon Laing.

Three for the space of one

Combined keyboard, VGA and Mouse (FVM) cables have tended to be bundled with high-end switches that allow you to control several machines from a single desktop. But they tidy up a single PC desk as well as a server farm and Lindy is now selling them separately. Prices start from £15 for a one-metre cable.

www.lindy.co.uk



\$20m deal puts Napster users on subscription

Napster, the file-sharing site that has shaken the music industry, has been bought out by one of the companies that was suing it.

It's claimed users will be asked to pay a \$4.95 monthly subscription following the \$20m deal with entertainment giant Bertelsmann.

The subscription money will be used to pay royalties

on downloaded music but it was unclear how this will be worked out.

Bertelsmann's label BMG will drop its suit against Napster as part of the deal but cases brought by other companies will go ahead.

Only days after the deal another beleaguered file swapper, Scour, was bought by Listen.com.

Napster was defended by Eurythmics star Dave Stewart at a broadband seminar in London – though he predicted that it would not last long in its current form. He said it would lead to changes that would give artists more freedom and reduce the stranglehold of record companies – full story p 42. See *Tim Bajarin*, page 50.

G4 OFFER

Apple is offering a £250 discount until the end of the year on its G4 PowerMac Cube in a bid to boost poor sales of the machine. List prices start at £1,249 excluding VAT and monitor. Apple's share prices have dropped 60 per cent after lower-than-expected revenues.

CARRERA BOUGHT

Digital Networks has bought troubled PC dealer Carrera for an undisclosed sum. Warranties on Carrera machines bought via credit card or finance deals will be honoured, promised Digital Networks director Mark Johansen-Berg. Corporate deals will be renegotiated. Digital Networks 0870 4441940

RUSH JOB

A BBC Choice programme called RUSH is developing a toolkit for contributors to make their own web-based documentaries about the coastline. It is also looking for ideas on the theme. See www.bbc.co.uk/choice/rush

'Spy' traps erring lovers

Software developed to help firms monitor staff use of the Internet is being most used by people spying on their partners.

According to developer Spectorsoft, one woman discovered that her fiancé was carrying on with 17 different women via chat rooms. She wrote: 'I was able to truly see what a sick

and twisted individual he really is.'

The Spector II software, which takes regular snapshots of screen activity, was aimed at helping concerned parents keep an eye on children.

But Spectorsoft president Doug Fowler said: 'More than half of our business is coming from suspicious spouses.'



WIRELESS

Battle of the airwaves as four technologies compete to spread data round homes and offices

Wireless Ethernet gets the blues

Wireless networking is set for a battle of technology, price and even air space next year as demand grows for spreading broadband links round homes and offices.

No fewer than four different technologies will be using the same 2.4GHz waveband and rumours of contention between two of them, Bluetooth and 802.11b wireless Ethernet, appear to be true.

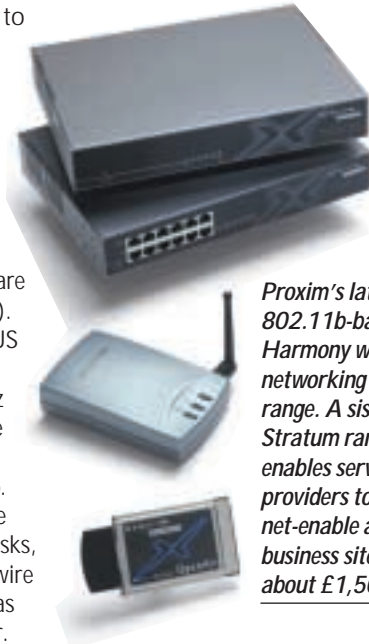
The other contenders are DECT and HomeRF. DECT is designed for voice and the chips are cheap because of its use in cordless phones. Reference designs of NatSemi's Webpads also use DECT. Significantly Pace, Europe's leading set-top box maker, is using DECT for its first foray into the area (see picture on page 25).

Bill Hoath of Pace's technology and strategic development division said this was mainly to get an affordable system to market quickly; it did not mean the company would continue to use DECT.

HomeRF looked to be out of the running until recently because it was limited to 1.6Mbits/sec, compared with 802.11b's nominal 11Mbits/sec (in practice data rates are around 4Mbits/sec). But a ruling by the US authorities opening HomeRF to 2.4GHz means that it will be able to compete on speed with 802.11b.

Bluetooth will be enough for some tasks, but it is basically a wire replacement and has no networking layer. Sun is supposed to be linking it to its Jinni personal area networking technology.

Bluetooth seems likely to complement rather than replace other wireless systems, but Lynn Chroust, director of product marketing at Proxim, bears out Ian Burley's report (see page 40) of contention between Bluetooth and 802.11b. She claims Bluetooth can cut 802.11b



Proxim's latest 802.11b-based Harmony wireless networking range. A sister Stratum range enables service providers to net-enable a business site for about £1,500

data rates by up to 30per cent; the hit on Bluetooth is less than 10per cent.

Proxim has just launched the 802.11 range aimed at business use, and Chroust says HomeRF will be much more suitable for the home.

Like Bluetooth it uses frequency-hopping, which is cheaper to implement than the direct-sequence technology of 802.11. It is

also less likely to interfere with Bluetooth. The networking layers of HomeRF and 802.11 are identical.

Potentially a major advantage of 11Mbit HomeRF is that it has eight voice channels, allowing the network to be used for cordless phones. It even uses the DECT protocols, though according to Chroust the transport layer is incompatible with current DECT phones.

She believes 11Mbit HomeRF cards (again the true data rate will be less than half the nominal rate) will be available late next year at between £35 and £50. This is half the price of current 802.11b cards.

However, 802.11b prices will drop drastically over the next few months, said Sean Keohane, the new head of SMC Networks. He also reckons wholesale prices of base stations could be as low as £170 early next year with client cards costing less than £70. 'We expect the price of cards to fall below \$50 (£35),' he said. CLIVE AKASS

Notebooks could outbeam handhelds

Internal mini-PCI slots could give notebooks faster and more flexible wireless links than handhelds.

Wireless standards and technology, like dial-up modems until very recently, are developing too fast to be integrated onto motherboards.

But swappable multi-function PCI cards could offer combinations of GSM, GPRS, Bluetooth, HomeRF and 802.11b connectivity on the same internal card – leaving external PC Card slots free for other uses.

Notebooks can deliver more battery power than a mobile phone or handheld, and any RF health risks would be less because the devices are used further from the brain (radiation drops off with the square of the distance) and, especially with internal slots, there is greater scope for screening.

Power and RF fears constrain upstream GPRS data streams on mobile phones to one or two timeslots per eight-slot 171.2Kbit channel (see PCW December 2000). In theory,

with more power and less RF more time slots could be used giving a faster data rate.

Moreover notebooks can pack substantial integrated aeriels – something Dell has already implemented in its high-end Latitude models. Lucent is reported to have made an 802.11b mini-PCI wireless Ethernet card for IBM and Dell notebooks.

Dell has also just launched PC Card-based clients for its new TrueMobile 802.11 range. Prices are competitive – £230 for a base station and £100 for a card – but still a

little higher than Apple's Airport range.

A mini-PCI V.90 modem is an option on Dell's latest Inspiron 8000 notebook. But Gerry Smith, Inspiron division vice-president, said multi-function mini-PCI cards are in the pipeline. 'It has been quite a task to design these slots into the notebook, taking into account EMC issues,' he said.

The Inspiron 4000 and 8000 have swappable panels on the lid and hand rest so you can choose your colour scheme. Both use mobile PIII from 600MHz to 850MHz.

The changing face of the PC



This neat little touch-screen B-2175 relies on good I/O to access peripherals that larger notebooks, often used as a desktop replacement, tend to pack on board.



The Multitainer (above) looks, acts and stacks like a piece of hi-fi equipment – it's pictured sitting on a Sony audio-visual control unit – but is at heart a Celeron-based Windows 95 PC. It combines the functions of a DVD, CD, and MP3 player, faxphone, games console and web box.



More downmarket is the Scolly web box, again Celeron-based (up to 600MHz), and with a choice of Linux or Windows. It can be used simply for web access via a TV set or as a straight PC.



The Jetson, looking not unlike a smart briefcase, is Fujitsu-Siemens' take on the legacy-free PC, eschewing internal expansion slots in favour of USB-linked peripherals.

Fujitsu-Siemens' design for life

The continuing mutation of the PC into a variety of 21st-Century species is reflected in designs from Fujitsu-Siemens, a new company jointly owned by the Japanese and German conglomerates.

On the notebook front buyers and designers alike must decide how much functionality should be packed inside a case. At the ultra-light end, in addition to the Transmeta model pictured on page 38, Fujitsu-Siemens showed the delectable-looking Lifebook B-2175, weighing a mere 1.3kg.

The idea of these designs, popularised by the Sony Vaio, is to contain all but the basics but at the same time provide good I/O to let you plug in peripherals like a CD-ROM. The 500MHz mobile Celeron-based B-2175 (pictured top left) boasts a 10.4in SVGA touch screen, PC Card and mini-PCI slots, two USB and an Ethernet port.

Notebooks range from desktop replacements to the 750MHz PIII Celsius Mobile 2 Win2K/NT workstation with



a 15in XGA screen integrated OpenGL 3D graphics and smartcard access (pictured above). A nice touch is the detachable infra-red keyboard.

Desktop and home designs are becoming even more varied as the pictures on the left show. Fujitsu-Siemens also showed a range of enterprise-level machines.

The new company, which has inherited a strong position all over Europe, plans a heavy sales push in Britain where it's relatively weak. This will place it in competition, especially in the corporate sector, with its ailing cousin Fujitsu-ICL.

64bit Linux falls to Murphy's Law

Fujitsu-Siemens recently showed 64bit Linux running on a Celsius 880 workstation based around Intel's forthcoming 64bit Itanium processor.

Or rather, given rider 234 of Murphy's Law, it showed Linux not running on Itanium. (Rider 234, famously applicable to Bill Gates, states that if anything is going to go wrong it will do so when you are demonstrating it to the press.)

The man in charge told journalists that the fault was with the software. 'There are a few bits to iron out with 64-bit Linux,' he said.

A multi-port for any notebook

Devices like the Easidock 5000 (right) seem likely to become more popular with the twin-trend towards ultra-mobiles and notebooks as desktop replacements.

The 5000, biggest in a range of universal docking

stations, provides desktop expansion potential.

A PC Card extends a notebook's PCI bus into the docking port. This one provides five drive bays, three PCI slots, two USB ports and legacy serial and parallel

ports. The 'expected' £481 shop price is likely to be discounted – after all, you can buy a full PC for that. Details are at www.mobilityelectronics.com.



Cloning made easy for CD pirates

The new DigiMatic duplicator is said to make CD cloning as simple as photocopying. The machine from O'Dixion not only clones a CD but can also print an image of the original label on to the Philips CD media at 1,440dpi.

It's built around a Sanyo

CD-R/RW drive, with 16-speed recording and Burn-Proof technology built in, and a 50-CD-R loading cartridge – all controlled by a simple keypad.

Because it can be networked, individual CD writers in an office may soon be things of the past. The

basic DM50 model, which doesn't have CD cloning built in, is priced at £2,730 ex VAT; while DM100s will be £3,650 ex VAT. The first units will roll out in December – no doubt leaving software pirates feeling like Christmas has come twice this year.

SCOTT MONTGOMERY

PROCESSORS

Transmeta's Crusoe chips are faster than they seem – and are causing a rethink of notebooks

Crusoe lands in ultra-mobile land

Transmeta's Crusoe chips appear to have sparked a rethink of the 'ultra-mobile' notebook as designers take note of the fact that the screen can draw more battery power than the processor.

IBM, Sony, Hitachi and Fujitsu have all announced Crusoe models shipping this year or early next. Details are sketchy on some models but all have small, sub-10in screens. Cooler chips allow for a compact, streamlined design.

The small displays are cheaper as well as more battery-friendly, and with screen prices falling in general, the new models could become very affordable as second machines.

They have the convenience of the Windows CE ultra-small notebook models with none of the limitations of the

cut-down operating system. Some of the machines will ship with Linux, saving on the price of Windows.

I saw the Fujitsu design at the



The Crusoe-based ultra-mobile

Munich plant of Fujitsu-Seimens, which will sell the machine in Europe next year; and very desirable it looked, too. It has an 8.9in widescreen

display (with a 16:9 aspect ratio) comfortable keyboard, and weighs about 3lb. The messages on battery life were conflicting: one official told PCW that it was four hours, while another said eight. But there was no talk of the incompatibilities hinted at by Intel propaganda, which is not to say they don't exist.

The 500MHz Crusoe was said to perform at about the level of a 300MHz Celeron, which is fine for running office apps, as well as expected, because the chip uses some processing power to translate x86 code.

Early tests in the US of Sony's Transmeta portable are inconclusive as they're based on benchmarks that involve rapidly switching applications. This did nothing to prevent lurid headlines

about the chip not performing to expectations.

But as PCW pointed out (April 2000 issue) these tests are misleading because the Crusoe caches translations. At first this is done on the basis of generalised statistics but the chip quickly learns which translations are most used for the tasks in hand, so it improves some 30 per cent quicker with time.

Sceptics have claimed that notebook makers are courting Transmeta only to give them leverage on Intel. Further doubts about Transmeta were raised when IBM said it would not bring out an announced Transmeta model.

If others follow suit, there could be a switch to Intel's forthcoming low-drain chip sometime next year (see story below).

CLIVE AKASS

Intel pushed further into power saving

Intel is to introduce a new battery-friendly chip next year in a move which shows an increasing interest in low-drain processors.

The company's head honcho for mobiles, Frank Spindler, said the low-drain PIII will use a form of its current SpeedStep technology that switches the chip into slower, low-power states when it's running on a battery and returns to normal operation on mains power.

He was speaking at the Microprocessor Forum, where two other companies announced low-drain x86 chips designed for mobiles and embedded applications. Also at the Forum were representatives from Transmeta, which has been boosted by announcements

from several vendors that they will ship mobiles based on its low-drain Crusoe chips (see story above).

California-based Rise showed its new iDragon mP6 chip running off a single AA battery, a combination it claimed could play a VCD movie or MP3 file for several hours. The voltage dropped from 1.5v to 1.1v during the demonstration, showing the chip could tolerate a variation of more than 25 per cent.

Rise CEO David Lin claimed the chip showed x86 architecture could match RISC chips for power drain.

The company said that it is in development of system-on-a-chip (SOC) designs based on iDragon mP6 cores with still more advanced power-saving features that will be used in multimedia-

enabled handhelds and 3G smart phones.

STMicroelectronics, formerly SGS-Thomson Microelectronics, announced two SOC designs which will be built using 0.18micron technology. The Vega and Pictor chips, part of a range known as Galaxy, are based on what is described as a PII-class core; claimed consumption under 'typical' conditions ranges from 1.1w at 250MHz on a 1.8v line to 200milliwatts (mw) at 66MHz/1.1v.

Power comparisons are difficult because drain depends on what the processor is doing. Also, on non-SOC designs, drain from peripheral chips must be accounted for.

Crusoes are said to draw between 500mw and 2w,

depending on the task; Intel's current mobile PIII uses a claimed 1w in lower-power mode. Both these need support chips. So, presumably, will the new low-drain 500MHz Intel PIII due to be shipped next year. Officials claim this will drain an 'average' 500mw in low-power 300MHz mode.

Interest in low-drain processors is not restricted to mobiles. Look at the cooling on Intel's new P4, which draws enough power to start your car, and you can see (or rather, hear) why.

Dr Joseph Reger, Fujitsu-Siemens' vice-president of strategic marketing, told PCW: 'A reduction in power drain of just a few per cent can make the difference between needing a fan or going without.'

CEATEC SHOW

The Japanese are getting blue in the tooth in a big way. Ian Burley reports from Tokyo

Digital offerings from the East

The inaugural CEATEC show, a marriage between a trade fair and a computing and consumer electronics show, was fertile hunting ground for the latest in Japanese high-tech digital innovation. Something like the giant annual CeBIT Fair in Hanover, it attracted 180,000 visitors over five days.

Mobile phones, specifically NTT Docomo models with Imode browsers, were the highlight from the Japanese perspective. Wideband CDMA phones were also much in evidence. Many of these phones had either built-in digital cameras or plug-in options.

The most noticeable trend was the ubiquity of Bluetooth product prototypes. A stand, run by Sony/Tektronix, demonstrated how Bluetooth could even shrug off channel interference from IEEE 802.11b wireless Ethernet networks. But it was also evident that the reverse is not true, which must be a major concern for the 802.11b industry (see page 28).

Everyone displayed something with a Bluetooth label. Cambridge Silicon Radio on the Trade UK stand, believed that much of what was on display from Japanese companies was simply hardware-only demos (see picture top right). Naturally, CSR was in Japan to demonstrate working radio modules with fully functional software on top. A sample Psion Bluetooth Gold Card (see middle left) was also spotted.

Meanwhile, Psion-backed Symbian appears to be making inroads into the crucial Japanese market. Sanyo showed some prototype Symbian palmtops (see bottom-left). Elsewhere, Hitachi followed in Sony's



Sony's Vaio SlimTop PC



Hitachi's DVD-RAM camcorder



Japan's hardware-only demos



Psion Bluetooth Gold Card



Sony's small pocketable digital sound sampler: the eMark



Sanyo's Symbian Palmtop prototype



Compact clamshell Windows CE – the NEC MobileGear II

footsteps by producing notebook PCs running the new Crusoe processor.

Sony, besides launching some very interesting new digital camcorders with still-picture capabilities, also showed its new Vaio SlimTop desktop PC with LCD monitor which can be positioned with the matching keyboard so that it looks like a notebook (see top left). The compact system box can be hidden neatly behind the monitor – the whole thing takes up almost no space.

Sony UK says it has no plans to bring it to Britain yet, but PCW thinks it's a trendsetter, so watch this space.

Sony also had another novel device called an eMark: a small pocketable digital sound sampler (see middle right). If you hear a tune that you like on the TV or radio, use the eMark to sample the melody. Send the recording via the Internet to a service bureau that will then identify the music, giving you an opportunity to buy the record if it's available.

At NEC, notebooks with built-in fingerprint scanners were much in evidence, as were some smart looking compact clamshell Windows CE machines, including the NEC MobileGear II (see bottom right).

The last word goes to Hitachi, whose long-awaited production DVD-RAM camcorder (see top middle) was officially launched at the show. We saw it in its prototype stage at Comdex last year, but now you can buy it – well, in Japan at least.

BROADBAND

Clive Akass opens a four-page broadband special with a look at the uses of fast links

An OpenWorld of possibilities

It was possible to feel sorry for BT OpenWorld in October, though perhaps not after sitting through endless renditions of *Nessun Dorma* as you waited for its ADSL support line to answer.

Breakdowns of its nascent ADSL service began shortly after the company threw a triumphant two-day seminar, attended by an impressive array of glitterati and digirati, at London's trendy Imagination Gallery.

A seminar, however glittering, may not sound like a big deal but it was a huge change from the old BT style. I still recall with irritation a 'breakfast briefing' for which BT dragged us out of bed to be served tepid tea and plain biscuits in a waiting room with no chairs. OpenWorld, nominally independent of BT, signalled that it was different.

The seminar highlighted the great unknowns of broadband: what will people actually use it for? How will it generate money?

Some uses, like video on demand, are obvious, though they won't be viable until a critical mass of people get broadband. Mark Gilman, president of new media at



Stewart: 'I enjoy Napster'

video-chain Blockbuster, announced that he was ready to deliver online when the market is right.

Tom Kressner, president of Yes TV which has been trialling ADSL-based video on demand (VOD) services, said DVD quality will be possible when bandwidths increase with the advent of next-generation VDSL. There was some discussion about what bandwidth is needed: 2Mbits/sec is considered necessary for near-VHS quality, but 4Mbit was preferable. (Yes TV rival HomeChoice is currently delivering video at around 2Mbit – see box, below).

Such services allow time-shifted viewing but they rest on the structure of the traditional entertainment media: conglomerates churning out content to the passive masses. A different view came from William Mutual, founder and chairman of a Hollywood-based company called Popcast, who said broadband will democratise film making and change the type of film that gets made.

His website at www.popcast.com acts on one level as a simple video portal where people can post their videos for friends to view. But the system, which is to be installed at the OpenWorld portal for UK use, can also be used for video-streaming small or larger-scale commercial products. 'We will manage the rights and ecommerce for you,' Mutual said.

The model is similar to that of music sites, like MP3.com, whose British-born president Nigel Powell also spoke at the seminar. The discussion turned inevitably to music 'sharer' Napster, which was generally agreed to be not viable without some form of cashflow, but crucial in breaking the power of the record companies.

One speaker said that some method of payment was needed that users didn't notice 'in the same way you don't notice paying your cable TV subscription'.

Powell said some musicians are making \$20,000 a month from tracks on MP3.com – and they're free of constricting contracts, although they are at liberty to make deals with record companies. He said MP3.com is experimenting with a subscription service (a

model since taken up by Napster – see page 27).

Dave Stewart, of the Eurythmics, said he enjoyed Napster and the controversy surrounding it. 'MTV and Napster have between them done more than anything to shake up the music industry,' he said.

He saw Napster in its present form as a temporary phenomenon that showed the time had come for a new business model in the industry. Online delivery will enable artists of all kinds, not only musicians, to make available material big companies would not touch.

He showed, by way of an example, a comedy short in



Powell: 'You can make \$20,000 a month from MP3.com'

the form of a mock commercial made by US actor Kevin Spacey. And he played around with the original unmixed tracks of a Sixties Marvin Gaye record: the kind of material that could be published on the web to give an entirely new dimension of listening.

'Record companies are living in the Dark Ages,' he said. 'It's time for a change of attitudes. It's time artists took control again.'

See also *Tim Bajarin*, page 50

More home choices

Home Choice, run by a company called Video Networks, is offering a novel ADSL service in parts of the south east.

Users will pay just £20 a month for an 'always-on' Internet service at 115Kbits/sec, down and upstream. This compares with roughly £40 a month for a basic 500/250Kbit service from other subscribers.

Optionally you can pay from £6 a month for a choice of video-on-demand services which are delivered at just over 2Mbits/sec via a set-top box. Installation costs £80 with the box or £40 without.

Tele2 is trialling a £9.99 a month 150Kbits/sec wireless service in Bradford and Leeds.

Details are at www.videonetworks.com, www.homechoice.co.uk and www.tele2.co.uk.

Server fibre to hit 10Gbits

High-speed server links will hit 10Gbits/sec over distances of up to 10km using a new fibre-channel standard designed to meet the needs of broadband data delivery.

Efficiency is also increased, so that real data rates will be 12 times those on nominally 1Gbit fibre channel (FC) connections, Fibre Channel Industry Association chairman Skip Jones told a London conference.

The 10GFC standard has yet to be endorsed by the ANSI standards body but the details have been agreed by the guiding T11 committee, he said. Products should be available by 2002.

10GFC shares architectural features and components with Ethernet and InfiniBand, both of which have been touted as potential rivals.

But Kumar Malavalli, chairman of the T11 committee, said Ethernet cannot match fibre channel for error detection and recovery, efficient large-block data transfers, and support of upper-level protocols like SCSI, audio-video fast file transfer, and Intelligent Peripheral Interface (IPI).

FCIA founder Ed Frymoyer questioned the need for Infiniband, which he described as an Intel technology designed to replace the PCI bus in super-fast servers but which extends beyond the PC.

He said servers did need to replace PCI internally but he could see no point in having a new architecture externally. He asked: 'Is this for the benefit of the user, or for the benefit of Intel?'

Intel has also been criticised for introducing USB 2.0 and Serial ATA buses for tasks covered by the existing 1394 FireWire bus (see PCW/November).

Satellites to take ADSL to those still left in the cold

BT is planning alternative fast links to the 30 per cent of Britain that ADSL is currently unable to reach. The links could be up and running as soon as late next year, according to BT OpenWorld chief technology officer Bob Foster.

ADSL users currently have to be within four kilometres of a local exchange, though the distance does depend on the standard of the line.

One possibility being considered is to use signal-boosters called repeaters at strategic points along the link to extend the coverage.

Another, already-on offer by independent providers in some areas, is two-way radio.

But Foster said the most likely solution will be satellites. These are already

in use for net access, usually only for the downstream link with a standard phone being used for the uplink.

Two-way satellite communication is expensive and used mainly by large companies. Foster believes it can be done for almost the same price as today's ADSL. 'That's a challenge to us. We are looking to make it in about a year but we are making no promises.'

BT researchers are also looking at ways to guarantee bandwidth for time-critical datastreams such as video. Foster says it requires better management software at the DSLAMs – the boxes at the exchange end of a DSL link.

This will improve matters only within the BT network. Improvements in the Internet

at large would have to await the implementation of IP version 6.0, the next-generation Internet protocol which should also ease the shortage of web addresses.

Foster estimates that this is about 18 months away. 'It's mainly down to Cisco, which must upgrade the software on its routers.'

Even so IPv6 will be implemented in pockets at first. An IPv6 link will need to find supporting servers all the way along its route. Foster said: 'You will probably find some slacker who hasn't implemented it.'

ADSL currently reaches around 40 per cent of Britain, a figure BT aims to increase to 50 per cent within a year and to 70 per cent before 2003.

Mistral offers ADSL in seven days



Service provider Mistral is offering to install ADSL connections within seven days – and to provide free installation if it fails.

Its service, aimed at businesses, costs marginally more than BT OpenWorld's basic business offering but

Spink: 'Businesses are intent on keeping their old links'

managing director Steve Spink says it offers extra services, including 1MB of web space.

Installation costs £260 and annual charges range

from £1,264 for a 500Kbits/sec link to £2,344 for 2Mbits/sec. The 20:1 contention ratio is the same as that of OpenWorld.

Mistral must rely on BT local lines, causing its offer to be restricted to the exchanges that have been ADSL-enabled thus far.

Spink says many businesses are trying out ADSL as a cheaper alternative to a leased line. 'But they are retaining their old connection until they are sure that ADSL is reliable,' he said.

Currently this is not possible for businesses that have only ISDN lines (see page 46). But Spink said: 'Most businesses have at least one analog line, perhaps for a fax machine, that can be used for ADSL.'

BROADBAND

Fury as ISDN users face ADSL delay

BT has infuriated ISDN users by announcing that they will have to wait until early next year to get ADSL installed – unless they pay for an extra connection.

Some have been told that they will need to uninstall ISDN and hybrid Home Highway links just to learn if their line is up to scratch for use with ADSL.

BT says that ADSL cannot be run over ISDN lines in Britain, although this has been achieved in Germany.

'We are currently advising Home Highway and ISDN



Foster: 'A cumbersome process'

customers to wait a little before contemplating moving to ADSL,' BT OpenWorld chief technology

officer Bob Foster told *PCW*.

'The trouble is that these services involve equipment installed at both ends [of the line, between the home and the exchange]... We are saying to people that we can't upgrade you at the moment because it is too cumbersome a process.

'However, we are working on a way of testing the line with the equipment still in place. This should be available soon.'

A BT spokesman added: 'It's not simply a case of disabling the ISDN line and

then installing an ADSL connection. All the billing, order handling and order managing services have to be changed at the same time.'

BT was much criticised for its slow rollout and high price tag levied on ISDN. A *PCW* reader, who did not wish to be named, said: 'They [BT] made us pay through the nose for adopting the technology early. They ought to be offering us special rates for adopting the new technology. Instead we are being penalised. It makes me mad.'

To NAT or not to NAT – that is the question

BT OpenWorld is to introduce an ADSL service that does not use Network Address Translation (NAT), a system that precludes major uses of the fast digital link.

NAT assigns a network address on an as-needed basis, making best use of scarce addresses and improving security because there is no fixed address for a hacker to target.

But it cannot be used with many Virtual Private Network (VPN) systems which 'tunnel' the Internet to make branch offices and teleworkers effectively part of a base local network.

Most VPNs currently use expensive leased lines or ISDN; ADSL could make them far more cost effective and affordable – if it worked.

NAT also stymies many Voice over IP services, which are very effective when they work over ADSL. The Net2Phone VoIP service does work with NAT. It is the system used by MSN in its current promotional offer of free calls from your PC to any number in the US,

including standard phones, absolutely free of charge. But other services are confused by NAT.

NAT interferes with the use of chatrooms and prevents a link being used for a web server.

BT OpenWorld is independent of BT, in theory at least, selling its services on the same basis as other providers like Demon. Some

OpenWorld rivals already offer a non-NAT option, which should be used with a firewall (*see below*) to block intruders.

There were dark mutterings that OpenWorld insisted on NAT to preserve BT's lucrative voice and leased-line businesses. However, chief technology officer Bob Foster said: 'We are working on a non-

NAT option, although I can't say exactly when it will be introduced. We still believe NAT is the best option for most businesses.'

Other sources indicated that the option will be introduced next year. OpenWorld is also likely to offer a special package for teleworkers, with a managed firewall and VPN.

Vendors scent secure-link boom

Security firms are sensing a big market in firewalls and Virtual Private Networks for remote workers and

branch offices as the cost of fast links drops.

Watchguard has launched a product called VPN Manager 2.0 which it claims provides a no-brain instant VPN between any two of its Firebox firewall-routers.

The company believes many firms see the advantages of VPNs but do not implement them because of a lack of expertise and worries about how they can be administered.

Hitachi recognises that mobile workers are also at risk and has packed a firewall



into its latest HN8300, HN7200 (pictured left and right, respectively) and HN7300 notebooks.



BROADBAND

MP3 can be words as well as music to your ears. Ian Burley reports on the audio book

Reading bits of the future

The digital audio music market is progressing extremely fast, stimulated by standards like MP3 and the gradual introduction of unmetered and broadband Internet access, and then highlighted by the controversy over online music sharing, provided by the radical Napster site. As the group test starting on page 227 shows, there are many pocket-sized MP3 players on the market and this functionality is being integrated into mobile phones by manufacturers such as Ericsson.

Companies like Pine are developing compact MP3 players with built-in FM radios plus a recording facility. Car MP3 players, from Empeg, for example are now available. Some CD and MiniDisc players can also now play MP3 tracks.

But, regarding digital audio books, the situation is less clear cut. Audio books on cassette, and more recently CD, have been around for years. The Audio Publishers Association (APA) recently published market research showing a 75 per cent rise in the use of audio books since 1999.

They were first produced for the benefit of people with impaired sight, and for the children's market. However, like radio, they also appeal to people who want to listen while they do something else: driving, walking, the washing up. I could be listening to one as I write this.

The market is still in its infancy but Forrester Research reckons that 426 million books will be downloaded via the Internet by 2004. Some companies, like AudioBooksForFree.com, which is launching in late 2000 will offer free



It's hard now to appreciate how much the advent of radio changed people's lives. You might think it has been overshadowed by television, but in fact radio is booming and the introduction of broadband will bring almost limitless new sources of the spoken word that can be downloaded to large-capacity MP3 players. It's hard to see these superseding the written word but the book trade is sure to go through some changes

downloads, making their money through between-chapter advertising and some content-based sponsorship.

Others, like Didio, part of Chivers, the UK's largest publishers of audio books, are following the more established commercial online music retailing model. Didio recently struck a deal with Magex, well established in the online music industry, to supply a system providing protection and payment systems for online sales of its audio book downloads.

From a technical viewpoint you would have thought that making and

distributing audio books in digital form would be a no-brainer compared to the demands of high-quality digital music or DVD video. You might assume that the spoken voice requires far less digital throughput than, say, music or video and therefore lower production constraints.

But there are problems; not least is the fact that books are hard to beat for portability and accessibility. They can take several hours to recite and will need to be spread across several cassettes and even several CDs,

although DVD can reduce the disc count.

In fact a simple cassette player has advantages over many MP3 players currently available. Ruslan Fedorovsky, of AudioBooksForFree.com, says his company has been forced to take on the task of evaluating as many different MP3 players in all their different forms to advise potential customers which players *not* to buy.

Fedorovsky said: 'We have found many frustrating problems. These include the lack of a bookmark facility to remember where you were when you switched off. Many players have very buggy software and there are problems playing MP3 version 2.5 tracks. Some players also have a very limited fast-forward and rewind facility.'

Memory capacity is another issue. Depending on the rate of compression, an hour's worth of audio book can amount to between 3.5MB and 70MB of data. A typical fiction audio book is five to six hours in length and it's clear that the online market needs broadband in order for it to take off.

More capacious hardware is beginning to appear. SSI Computer Corporation has recently announced a player called NEO 25 with a capacity of up to 20GB. Empeg's car MP3 player uses a hard disk and currently boasts 40GB maximum, with 60GB promised by the end of the year.

If you're interested in digital audio books, things are moving very fast and it may pay to get as much advice on the hardware you intend to use before committing to any one product. Oh, and get a very fast, or very cheap, service provider.

OCTOBER AGENDA FESTIVAL

Economic uncertainty, security and Napster are big issues at an IT summit. Tim Bajarin reports

Napster paves the yellow-brick road

For 14 years the October Agenda festival in Phoenix, Arizona, has been attended by 400 of the elite of the computer industry. Led by Bob Metcalf, the inventor of Ethernet, they look at what the industry will focus on over the next 12 months. They are perhaps the most powerful in the industry gathering anywhere in the world – though Bill Gates, mobbed as a celebrity even among the biggest players, has missed the event over the past two years.

Last year, most of these executives were pretty smug as their firms had ridiculous valuations and were rolling in money, both on paper and in real cash. But what a difference a year makes! Most attendees this year were still upbeat about the future of technology, although they were clearly more subdued when it came to forecasting their own fortunes.

Part of the uncertainty was due to the potential economic impact of higher oil prices and instability in the Middle East. Some stemmed from the presidential elections, though both US candidates were expected to be bullish on technology.

However, speakers and attendees alike agreed that privacy and security will be crucial in the coming months. The take-up of ecommerce and new devices will be sluggish unless people can be persuaded that their data is safe and that any commerce transaction is secure.

The need for broadband and cellular links was stressed as vital for the delivery of new applications and services. But those working on these technologies reported that neither would mature quickly – at least in the US. Full broadband deployment in the US is unlikely until 2007

and high-speed cellular connections are five years away at the earliest.

Europe and parts of Asia, with their more homogeneous standards, will lead the way with wireless connections.

Craig Barrett, Intel's president and CEO, declared that as far as he could tell Moore's Law (which predicts that processing power will double every 18 months) will be good for at least another 10 years. Detractors say the law is no longer relevant as the PC is already more powerful than anyone needs.

However, Barrett said that if you give software engineers more power to work with, there is no knowing what they will come up with. (This explanation for why Intel spends billions developing ever more powerful processors may seem a little flippant, but remember that when the PC came out people had very little idea what they would use it for.)

Microsoft president Steve

Ballmer spoke on his .NET strategy which he said would take three years to roll out. But he stressed that much of the underlying architecture will be laid out next year, allowing software engineers to begin designing around it.

Microsoft has done a poor job of communicating .NET and many in the audience told me they were still waiting for a good explanation. Ballmer assured us that we would all be clearer by the end of 2001.

The last and best session focused on giving more power to the user and specifically dealt with Napster. Panel members were Napster founder Sean Fanning and his interim CEO Hank Barry, Jonathan Schiller, partner of Boise, Schiller and Baxter, the law firm representing Napster against the Recording Industry Association of America, (RIAA).

Fanning started out explaining how his peer-to-peer music file sharing

worked. But the session became really interesting when Barry began talking about the lawsuit and Napster's attempt to settle with the RIAA.

Barry pointed out that Napster had offered to pay artists but the RIAA had refused. He said that when you get past all the posturing and legal mumbo-jumbo the case had nothing to do with copyright, and everything to do with control of distribution. The RIAA saw Napster as a major threat to the control it had enjoyed for decades.

Fanning, Barry and Schiller all pointed out that in a digital world, this control of distribution will fall regardless of whether Napster survives. Given the level of Napster use, it is clear that the music industry needs to find a way to sell digital singles and custom CD music mixes if it even plans to be around in future.

See also page 42

Music industry to get a belly-full of HipZip

MP3 files downloaded to players like Iomega's HipZip – launched in October – are bypassing traditional distribution channels. However, this is something the music industry will just have to learn to live with, the Agenda conference agreed.

Iomega has been vacillating about the HipZip, or rather the 40MB mini-discs that it takes. When these were first mooted Iomega called them nHand disks. At launch they were called Clk! Disks and targeted at pocket devices like cameras and handhelds. In fact, to our knowledge, only one camera manufacturer, Agfa, has used them. Now they have been dubbed PocketZip disks, although it seems the name Clk! will also be used.

The HipZip is one of the players reviewed in our group test, starting on page 227.



Intel's new processor has been surrounded by both facts and rumours, says Gordon Laing

Look P4 you leap



After what seems like an age, the Pentium 4 processor is to launch at the end of November. The P4 was supposed to arrive one month earlier, but was delayed due to problems with its 850 'Tehema' chipset and supposedly one specific PCI

graphics card. This could be one of the most significant processors of 2001, and if you're quick, you might just be able to sneak one under the tree in time for Christmas.

The P4's NetBurst micro-architecture is the first from Intel since the P6, introduced with the Pentium Pro back in 1995. Intel, of course, says this architecture is optimised for the Internet, streaming, 3D and speech environments, but what's really under the hood?

Beyond the confusing CPU terminology of more efficient speculative execution, faster arithmetic logic units and hyper-pipelined technology, the P4 most obviously boasts a 400MHz system bus and 144 brand new extensions as part of SSE2 (Streaming SIMD Extensions 2). The 400MHz system bus is a conventional 100MHz clock that's been 'quad-pumped', but can still deliver three times the bandwidth of the PIII's top 133MHz bus, and finally takes on the 200MHz (effectively double-pumped) bus of AMD's Athlon and Duron CPUs.

SSE2 is potentially terrific, but could end up muddying early P4 performance results. Like SSE on the PIII, and MMX when it first turned up on the 166MHz Pentium, SSE2 will only accelerate applications if they're specifically written to support it. I remember PCW's first PII vs PIII features, with both 450MHz CPUs scoring exactly the same under our non-SSE optimised benchmarks. To see the real benefit, your software needs to be aware, and I know of no SSE2 applications. They will come, but until they do don't expect miracles from the P4 running at the same clock speed as the PIII.

Perhaps this is why Intel is launching the P4 at 1.4 and 1.5GHz, approx 50 per cent faster in raw clock speed than its fastest PIII. It's a cunning marketing move that should ensure the fastest P4 always scores higher than the fastest PIII, even with software not written with SSE2 in mind. Finally, the P4 with its debut 850 Tehema chipset only supports expensive RDRAM - for now.

So what about the gossip? As usual, Intel refuses to officially comment on products that have not been

released, but the company naturally plans future roadmaps that inevitably find their way out of the Santa Clara headquarters. Intel's alleged roadmap for 2001 was already doing the rounds on the Internet as we went to press and has some interesting, if unconfirmed, details.

Notably, the PIII should enjoy significant evolution during the next year. Indeed, this coming summer should see the PIII gain a further die-reduction from 0.18micron (Coppermine) to 0.13micron (Tualatin). The Tualatin PIIIs are rumoured to feature 512KB of on-die Level 2 cache (double that of Coppermine PIIIs), new voltage requirements and possibly a 200MHz system bus in later versions; the last two features will probably make them incompatible with current FC-PGA motherboards. Tualatin PIIIs are likely to debut by the middle of next year at 1.26GHz, shortly after the relaunch of the recently withdrawn 1.13GHz PIII (in a newly stepped 'Coppermine-T' guise).

More importantly for early P4 adopters is the rumour that the chip will physically change its interface from 423-pin to 478-pin around next summer. It is expected that Intel's forthcoming Tehema-E (RDRAM) and Brookdale (hopefully DDR SDRAM) chipsets will support this new version, codenamed Northwood. Like the Tualatin PIIIs, Northwood is expected to be

**SSE2 applications will come, but until they do
DON'T EXPECT MIRACLES from the P4
running at the same clock speed as the PIII**

manufactured using a 0.13micron process capable of speeds up to 2GHz, with 512KB of on-die Level 2 cache (double that of the first 'Willamette' P4s).

Since much of the real benefit of the P4 requires new software written for SSE2, it may be sensible to wait a couple of months before committing. By that time we'll also have proper results and news on alternative chipsets supporting cheaper SDRAM memory, not to mention firmer details on the improved Northwood version which, if rumours are correct could leave early P4 adopters without a significant upgrade path. In the meantime, anyone looking for the highest performance PC should best stick with a 1.2GHz Athlon, or the increasingly humbled but ever better value 1GHz Pentium III.

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Barry Fox smells something fishy in the way the copy control system has been opened up for testing

Jump in, test the watermark



The SDMI's offer of \$10,000 to anyone who can crack its audio watermarking and copy control system (www.hacksdmi.org) has split the industry. Some see it as a humble way to check technology before unleashing it on the open market. Others,

including the *Linux Journal* and Electronic Frontier Foundation, regard the challenge as a cheap way to buy consultancy. I'd say it smells fishy, coming so soon after a series of listening tests on the system which were plainly just a PR charade. And at a recent Audio Engineering Society seminar in Los Angeles, it became clear that hacking is inevitable. To get a fix on likely holes in the system you first need to struggle with the mind-glazing complexity of what the SDMI mark does, and why.

The aim of the Secure Digital Music Initiative is to 'manage' copying, not prevent it. Phase one of the system relies on a watermark, developed by US company Verance; 72bit digital code is superimposed on the analogue music waveform by subtly altering peaks and troughs. Supposedly the analogue changes are inaudible but survive transmission, digital coding, compression, decoding and broadcast on AM radio.

Since last December sensors in Phase one solid-state portables have been able to identify the copyright owner and control the number of copies that can be made. Ferret software can crawl the web looking for marked music. After tests with un-named music industry employees, held behind closed doors in the US, the 4C Entity (Panasonic, Toshiba, Intel and IBM) adopted the same Verance watermark for use with the new super-hi-fi system, DVD-Audio. The hi-fi world fears that the extremely high quality of DVD-A, which samples sound at 192KHz and codes with 24bit PCM words, may make the mark audible to keen ears. Listening tests staged in London to 'allay fears' gave a 50/50 result that the music industry takes as proof that the mark is inaudible. Critics say the tests were not tough enough to expose problems that may take time to recognise. The test sound was sampled at 96KHz, not 192KHz, and the mark carried only a 12bit payload, not 72bit. As DVD-Audio players are now on sale with Verance chips, the standard could not have been changed anyway.

The SDMI is now testing a Phase two system for

Internet use. Phase one portable devices will be upgraded by firmware download. Phase two players will 'screen' music. There may be a dual mark. A weak mark is lost during compression, but a strong one survives. So music with one watermark, eg from a garage band seeking a wide hearing, can be freely copied. Commercial recordings have both marks; the weak mark is lost when the music is ripped, but the strong mark remains, signalling unauthorised compression. So a Phase two player will refuse to play it.

The SDMI is testing four Phase two marks. It is a safe bet that Verance will again win, Verance has filed a string of patents on the technology. They are hidden under various names but not hard to find if you know where to look (eg WO 98/53565 and 97/37448). The company argues that the patents do not fully describe the system. If so, there was no point in filing the patents because they do not offer legal protection.

The Fraunhofer Institute, which developed MP3 and has worked for years on watermarking, believes the SDMI has made a fundamental mistake in putting its mark in all music and all players, throwing the secret open to analysis. Fraunhofer also disputes Verance's claim that the watermark system can be 'renewed' if hacked.

Although the SDMI's challenge only ran for a few

The Fraunhofer Institute believes the SDMI has made a **FUNDAMENTAL MISTAKE** in putting its mark in all music and all players

weeks, it gave hackers the chance to download examples of the same music with and without marks. Analysis of all four marks is already circulating. The Verance Phase one mark is coded into three bands of added noise, at 4-6KHz, 6-10KHz and 10-14KHz. The Verance Phase two proposal also adds a cyclic phase distortion (moving at 0.333Hz), to obscure the Phase one mark.

Verance and the SDMI also face cryptographic collusion attacks. If the same music is available from several sources with slightly different marks, synchronising and summing the wavefiles can reveal or reduce the mark. Says Fraunhofer's Director Karlheinz Brandenburg: 'The SDMI system may give us a few years, a few months, or a few days, but it's not for eternity.'

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AIBO is cute but if you're waiting for the AI revolution – don't bother, says Brian Clegg

Artificial what?



In the run-up to Christmas we've seen a lot of the mark II Sony AIBO, the robot dog with artificial intelligence (AI). This sleek electronic toy is great for gadget lovers, although you could get a real dog with real intelligence for a lot, lot less

cash. But let's concentrate on the clever bit – the AI. When you look at what AIBO can do, it's not all that bright – perhaps rivalling a bluebottle with a migraine, but no contender for *Who Wants to be a Millionaire?* The term 'intelligence' is being stretched here – something that's all too familiar in the business world.

From the corporate viewpoint, it's tempting to group artificial intelligence with the Bay City Rollers – both made a big splash, only to disappear into obscurity. In the 1980s and early 1990s, corporate IT departments were thrilled with the possibilities of using computers in ways that mimicked human thought. True, there weren't many real success stories, but it was early days. It stood

It's tempting to group artificial intelligence with THE BAY CITY ROLLERS both made a big splash, only to disappear into obscurity

to reason that competitors wouldn't say much about their successes – this was leading-edge stuff.

A colleague who spent 10 years working in this field eventually got fed up and moved into training. The only way to make money out of AI, he thought, was to teach people about it, not to use it. Business artificial intelligence seems to be going the way of the pogo stick and the Stylaphone. The marks of decay are there for all to see. What went wrong? Take one of the principal technologies, expert systems. It was sad to watch the scope of this concept collapse with its name. When the grandiose possibilities of mimicking human intelligence focused down on expert systems, it soon became clear that expertise was too much to hope for, and the discipline was renamed knowledge-based systems then, ignominiously, rule-based systems. It was about this time that some large companies got out of AI.

Expert systems try to encapsulate a person's useful knowledge in a computer program. The expert is always

reassured that the reason is to provide them with support, but this is clearly untrue – the only reason corporates poured money into expert systems was to replace expensive experts. So conspiracy might form a neat explanation for the failures. Could the experts have deliberately fed garbage into the computers to ensure that they weren't replaced by a box that worked 24 hours a day for no more pay than an electricity supply? Like most conspiracy theories, it's attractive, but over-complicated. Any serious task proved too much for the system – often a PC package – to cope with, and anyway, experts found it near impossible to describe how they made their decisions.

Rules-based systems can work, but because of system limitations they're often low in value. These tend to provide a tiny subset of knowledge that is useless in its own right – like diagnosing ingrowing toenails – or a rigid collection of rules with no business value. If an expert systems practitioner automates a company's staff regulations it doesn't do much for the bottom line.

Similarly, neural networks, which model the basic structure of the brain, began with great promise. I can remember being bombarded with neural networks software in the early 1990s. The neural network is used as a forecasting tool that learns as it goes along, getting better and better matches to the real world. At least that's the theory. In practice business neural networks rarely get past the demonstrator stage. They are fine in a demonstration, but can't cope with the rigours of a full-scale system.

It's not all doom and gloom, though. Rule-based systems have found niches where the knowledge fits the narrow gap between trivial and much too complex, and simpler knowledge-management systems that don't pretend to have intelligence have become big business. Neural networks have been used effectively in stand-alone forecasting and text recognition. Other techniques like genetic algorithms and case-based reasoning hold out promise. Help desks, credit checking and technical diagnostics have all benefited from artificial intelligence. The technologies are getting better (and AIBO is undeniably cute), but don't hold your breath for the AI revolution.

Next month, Roger Gann will be taking over the *Business Matters* column and can be contacted at rogerg@pcw.co.uk.

Nik Rawlinson holds his hand up and admits that his website isn't designed with dyslexics in mind

Mea culpa, mea culpa



I have a very bad site. It should be removed from its host provider's servers, probably. I'm happy with what it says and I'm proud of the way it looks, but it does two unforgivable things. First, parts of it use red text on a white background. Second,

compounding the problem, it has a graphical menu system with no ALT tags to describe each image.

Neither may sound a major transgression, but combined they put my site out of bounds to vast swathes of the Internet population. When it comes to building a site many designers assume users have the Flash plug-in installed. Most never consider you might be using Netscape or Opera rather than Internet Explorer, and a scary number don't think twice about building pages that only work at 1,024 x 768 and above.

I did none of those things, though – I did something far worse. I assumed that most, if not all of the visitors to my site would have perfect eyesight and not suffer from

I did something far worse. I assumed that most, if not all of the visitors to my site would have PERFECT EYESIGHT and not be dyslexic

dyslexia (and before fingers reach for keyboards and my email address I'm not saying that dyslexia is in any way connected to eyesight).

I'm not alone – most sites pay little attention to designing for users who do not have the same facilities or abilities as the author. However, Dyxi, perhaps one of the most worthy recent dot.com start-ups aims to change all that with the launch of a new portal designed specifically with dyslexic users in mind. Founded by Alun Walford, himself dyslexic, it could soon become as recognised an Internet brand as Amazon.

Alun didn't discover he was dyslexic until late in life. Approaching retirement after 20 years in the Royal Marines, he was hunting for new jobs and finding the constant form filling difficult. He took a dyslexia test, and acute dyslexia was confirmed.

It was this discovery that prompted him to found Dyxi, which aims to offer guidance and support to not only the dyslexic community in the UK and beyond, but

also to web designers and developers who want to open their pages to everyone.

Dyxi's logo will be offered to all sites making a commitment to being dyslexic friendly. Clicking on a logo on any compliant site will open a small applet that will change the text and background colours on the page. It is a recognised fact that colours can affect how easy it is for dyslexic users to read words on paper or a screen.

Sadly Dyxi's site itself doesn't yet practice what it preaches. Although Alun assures me that two years of research have gone into Dyxi's colour scheme in an attempt to make it as widely acceptable as possible you can't yet click on the Dyxi logo and change the scheme yourself. It also uses no ALT tags to label graphics, but the site is still at revision one, and at the time of writing remained an online work in progress.

Potentially more valuable to the dyslexic community, though, is the Dyxi passport, a credit-card sized CD-ROM holding a dyslexic user's personal information. This could be anything from simply their name and address to their medical records. Stored in HTML

format it can be handed to shop assistants and any form fillers, saving the dyslexic user the task of entering the data themselves.

It's a great idea in principle, but sadly I don't yet have confidence that enough high-street stores have the resources to put it to good use. The information can be printed onto the face of the disc, too, Alun assured

me, but I still feel that one fundamental thing is missing here – an online database holding the information and the comms infrastructure to put it to good use.

Putting this information online as an integral part of the Dyxi site, and giving each signed-up member a user name and unique password would save on the production of cards and allow for immediate updates.

But this is unlikely to happen until Internet connections are as common as power connections, and every cash register in the country is an online appliance – after all, if fridges and washing machines can now log on, why can't tills? At the end of the day, though, what this really shows is that it's not the dot.com millionaires who are driving the UK's Internet revolution – it's services like Dyxi, run by just two people with a vision and the conviction to follow it through.

To see Dyxi for yourself, visit www.dyxi.co.uk. My 'very bad site' can be found at www.nik.co.uk.

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letters

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WINDOWS OVER-RATED?

I don't advocate unfair reporting but I get the feeling that Microsoft products like Windows Me are being over-rated in the pages of PCW. Have people become so used to the mediocre, half-functional world of Microsoft products that they have come to expect nothing more? It seems Microsoft is more concerned with its logo than its kernel or overall stability.

I believe you have judged the OS not by its own worth but by the software available for it. There may be more software for Windows than for any other platform, but this isn't Microsoft's doing. After reading your review, it would seem that Windows Me is just Windows 98 with a few tweaks, possibly worthy of two or maybe three stars. However, you've given it four (albeit from a novice user's point of view). If

you're judging for home use, why didn't you let home users test it? I wonder whether they would have been able to negotiate the MSCONFIG conundrum at the beginning of the installation or the changed position of the As Web Page option, or even cared. I also wonder whether they would have a PC of the specification on which you generously tested Me in your review. And one last thing – why do you praise Microsoft for including a new version of Media Player? It won't affect Windows users because they can download it and non-Windows users surely wouldn't pay £150 just for a media player.

Is your audience the advanced user as the tone of the article suggests, or the novice as the number of stars at the end suggests? You commend its advantages to both novice and technical user. You ignore its disadvantages to both.

OLIVER KROLL

NIK RAWLINSON replies >

All reviews are approached from the viewpoint of an end user, and you are right – some users may have been unable to work out the MSCONFIG fix we used to get around our initial installation problems. At the end of the day, you should remember that PCW writers are home users, too. We each own a machine running Windows and many of us also run Linux, BeOS and Mac OS. Indeed the Windows Me review to which you refer was tested and written on my own PC at home. You cannot ignore the fact that the vast majority of computer usage occurs in a Windows environment, and so a review of Windows Me must be taken from an upgrade point of view. As such, we felt it was worthy of the star rating given although, as pointed out, anyone considering the package must also take into account the price and balance this with what they are getting for their money. In a standalone review stars are awarded on the basis of how that product compares to its direct alternatives, so Windows Me will be star-rated in relation to other versions of Windows. It would be unfair to rate it in relation to Linux or an alternative OS outside of a group test.

SLOW DOWN!

My company supplies computer systems to students with disabilities and special

needs. The software used on the computers is highly specialised but works fine on anything above a 400MHz Pentium II. However, while a 400MHz chip is adequate for our needs, we've seen our supplier discontinue systems with 533, 566, 600 and 633MHz chips.

Each time a newer model comes out, there is a slight change in price. We then have to go to the local education authorities and say 'Thanks for using our company, but since our original quote less than a month ago, the computer has been discontinued by a model with a far faster processor, which will be under-used as the software doesn't need it'.

I've heard a lot about the supply and demand of Intel processors, but what of AMD? Is it shunning its slower speed processors (and users) in favour of faster ones? When will this speed war end?

ANDY DAVIS, ICT MANAGER, BARRY BENNETT

ADS-HELL?

Calling all BT Home Highway ISDN users thinking of converting to ADSL, and BT OpenWorld in particular. When your yearly ISDN contract is up, watch out for a smack in the face – a £50 charge for removing the ISDN set-up.

The problem is that BT OpenWorld is unable to test and install ADSL on an ISDN line, it needs an analog PSDN line instead. OpenWorld is conducting tests to integrate ADSL onto an ISDN line set-up, but it's not available at the moment and no-one knows when it will be.

When will BT stop kicking loyal customers in the teeth, and is this legal? The ironic thing is I am not abandoning ship, just moving between BT services. The moral of the story is, just remember when joining the highway, there could be a toll at both ends.

JOHN A WILSON

CLIVE AKASS replies >

BT is trying to find a way to test lines like yours for ADSL fitness without uninstalling the ISDN or Highway boxes – see the story on our news pages. It is unfair but I fear there is little to be done: BT is undergoing cataclysmic change and there will certainly be other anomalies like this in future.

LETTERS OF THE MONTH

TAKE HEART

Some people will do anything to stand out from the crowd – including Chris Main from Alderney in the Channel Islands. His colourful competition entries certainly attracted our attention and we thought it only fair to share them with you...



WINDOWS FOR ALL?

I recently purchased a new PC and was surprised to find that the OEM version of Windows Me did not come with the system's installation CD. If I want a copy, I have to pay an extra £50. Not wanting to be left stranded, and in case I ever needed to replace the hard disk, I forked out the extra cash.

Several weeks later, my CD had not arrived so I rang the PC manufacturer. I was told it could not supply an original CD-ROM – the Me files are stored on a hidden partition on the hard disk and a special CD is used to access this using Norton's ghost program. In effect, all that is supplied is an image of the hard disk. An image that cost me £50!

I was also told this hidden partition was causing a Linux installation problem and to solve it I would have to wipe the hard disk and erase the hidden partition. The only side effect was to completely lose Windows Me, without a way to restore it!

PAUL HILES

POWERFUL ADVICE

I must respond to GPU Power UK's reply to Mr Boston's Shocking Experience (Letters PCW/November 2000). In my opinion, all electricity suppliers palm off customers with talk of 'network switching spikes' and the supply being within 'acceptable limits'. They then suggest that you should purchase extra protection for your sensitive equipment. The nerve! Even a power washer or welder can cause spikes that are enough to cause severe glitches or damage to equipment.

So, what's the solution? Electronic equipment aimed at consumers is designed to be cheap to manufacture

and as a result comes with only limited protection. As this is the case, I would recommend some form of extra mains spike suppression. Unless a PC has to be on 24 hours a day, a mains conditioner is ideal and is cheaper than a UPS (uninterruptible power supply). I would also suggest that all external mains kit connected to your PC should have some form of extra surge suppression fitted – a protected multi-way socket at least.

Living in a rural area, my TV, video, and stereo system are more tolerant of mains 'fluctuations' but my PC grinds to a halt at the slightest hint of a network switch without my mains conditioner.

Of course, having mains protection is no guarantee against system crashes, but since fitting a £150 conditioner to my main PC, and plugging everything else through a protected six-way multi-socket, costing £25, I haven't had to replace any more 'fried' components.

COLIN HENDERSON

IMPROVE QUALITY OF MP3

Ben Havicon (Letters PCW/December 2000) makes some very good points. Record companies have no more right to rip off consumers than consumers have to rip off record companies and there is nothing wrong with MP3, in principle.

However, there are problems that need addressing before it becomes the *de facto* standard for music. For a start, many legitimate MP3 recordings are over-compressed to speed upload times. Surely it isn't too much to expect files to be compressed to a common standard when buying music online. And if this means incorporating a hidden, unalterable label or watermark then so be it. To obtain adequate quality, it appears

that music cannot be MP3-encoded to much less than 2Mbytes/min. 3Mbytes/min is definitely better, but even that isn't as good as an analogue cassette tape, never mind a CD.

Another problem concerns congested networks and large phone bills. Until reasonably priced ADSL is near universal, pay-per-view broadcasts using digital television would be a more appropriate way of distributing music. This would also provide an obvious means for the copyright holders to be paid for the content provided. In fact, why do we need to use up vital online time to download music? I'm prepared to buy CDs over the Internet and wait a day or two for them to be delivered.

An even bigger problem is the fact that PC sound hardware is nowhere near as good as that found on 'proper' hi-fi systems. The sound of the PC's fan is about as loud as the background noise associated with 78rpm shellac discs. Even vinyl LPs have 20DB more dynamic range before reaching anti-peak volumes than the typical PC!

BRIAN BEESLEY

RICHARD MCPARTLAND replies >

You raise some interesting points. Your idea about using digital television for music distribution is a good one and is not without precedent. You may remember the days when BBC Radio One used to broadcast programs for the BBC micro early in the morning.

Regarding your comments on PC sound hardware – we agree that PCs generate a lot of background noise, but shop around and you can find quality audio components for your computer. In fact, many games are now being developed with multi-speaker systems in mind.

WORLD CLASS?

Reading Nik Rawlinson's column on free Internet access (404 Not Found, *PCW* November 2000), I was amazed to see no mention of the NTL World offering. Although NTL received some bad press due to the length of time it took to roll out CD-ROMs to would-be users and seemed to give priority to BT customers in exchange for re-routing calls via the NTL network, the service is excellent. For NTL customers the service is about as free as you can get and for BT customers (with a £10 per month phone bill), it is also free.

So what's the down side? As far as I can tell there isn't one. The service is excellent and it is rare that a connection cannot be made. Connection speeds are also excellent – 52Kbits/sec without fail.

My only gripe is the two-hour cut-off time. Even this can be got around – I'd advise Darren Tanner (Letter of the month, *PCW* November 2000) to use GoZilla or similar to resume any downloads and I really don't think it's too much to expect users to reconnect once every couple of hours.

As Nik points out – all thanks to Andy Mitchell ex-MD of AltaVista.

ANDY BIRD

PDA PREDICAMENT

I read your recent PDA group test (*PCW* December 2000) with disappointment. Your whiz-kid reviewers presumably look on these devices as glamorous gadgets on which to play games, listen to music and even look at video, but I do believe they miss the point, which is summed up in the introduction to the article 'to store important contact details and to keep track of meetings and events'.

Did any of the subsequent reviews add to our knowledge of the abilities of each device when it comes to these functions? No, we found out that the Casio was an excellent MP3 player and that the iPAQ could play MPEG files – no mention of whether they could remember your next dental appointment.

I plan to purchase a palmtop shortly but still don't know which ones are best at maintaining diaries. Which ones deal with handwriting best? Which ones are easiest to use for practical day-to-day tasks? Even a small amount of each review devoted to the basics would have helped!

While these devices undoubtedly appeal to gadget freaks, I suspect most people purchase them to help organise their lives. In my opinion, your reviews failed to address this aspect of their use.

DAVID J PARTON

JALAL WERFALLI replies >

You make an interesting point but the days when PDAs competed on contact and agenda setting functions is long gone. All of the units on test will be able to cope with these functions with no problems – as with many aspects of PDAs, it really comes down to personal choice. That's why the PCW team spent much longer than usual discussing the merits of each machine and we all had our own personal favourites. Some of us preferred machines running Windows for Pocket PC, others the Palm or Psion OS, making for hours of heated debate.



THE WOW FACTOR

I didn't greet the latest copy of *PCW* with quite as much excitement as usual. I wasn't sure why this was the case until I opened it up. Although *PCW* content is far better and more accurate than most magazines, it seems to be generating the same tired old articles over and over again.

Flicking through the magazine, there's news, which I've read on PC news websites several days or weeks earlier, comments from the editorial staff, letters, a few dull reviews, an article on Home Entertainment PCs (with bog standard and uninteresting systems on test), a lot of Hands On, lots of ads and finally a little article about Atari 400/800. That was it – nothing to keep my attention, nothing new, nothing exciting.

So, how could things have been improved? Well, the PC group test would have been much more fun if you had included just the best systems and set four or five manufacturers a budget of £10,000 to see how extreme they could build their systems. It would have been a real title grabber. The return of the small gadgets section would also be a step in the right direction. I think you should have built it into something bigger rather than removing it.

As there are many articles on the Internet relating to the P4, a debate between the editorial staff as to what they thought the P4 would achieve and where it would fail, would be good.

PCW is in real danger of dying off through lack of excitement. OK, maybe PCs are not the most exciting topic, but you could at least make an attempt.

JAMES AD STORMONT

RICHARD MCPARTLAND replies >

Taking your last point first, PCW, like other computer magazines, is bound by non-disclosure agreements that determine what we can and can't reveal regarding Intel's chips – and when. However, rest assured the PCW team pulled out all the stops to include Pentium 4 news and reviews in the magazine as soon as we could.

Regarding your idea for our Ultimate Entertainment PCs – we're not quite sure what you could buy for £10,000 that you couldn't for a few thousand. Even with the 'best' graphics card, monitor and processor installed in a system, you're still going to be left with lots of change. It's also in a manufacturer's interests to submit machines that people will be able to afford.

As to the allegation that we generate the same articles over and over again – with technology constantly changing it's inevitable that we sometimes re-examine areas we've covered before. However, there are lots of completely new topics discussed in our features and futures sections, not to mention elsewhere in the magazine.

EASY DRIVING

PCW is always packed with innovative, high-tech products but examining an advert in December's magazine, even I was in for a surprise.

It would seem that one of your advertisers now sells a product that solves a problem that has concerned the Institute of Advanced Motorists for years. That of improving the attitudes and standards of drivers and it does this by doing away with them altogether.

The item in question is the 'LeMans Wheel' which not only boasts a 'hand-stitched leather cover, a realistic feeling, a solid-aluminum gear shifter and removable foot pedal'. The ad also claims 'no drivers necessary'.

So, if I fit one to my car, can I expect to be chauffeured to my destination? If so, it's clearly a bargain at £45.83.

PETER HARRIS

CLARIFICATION

The contact number for Proxima was missing a '2' in the last issue. The correct number is 01628 666 622.

REVIEWS

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Jason Jenkins
REVIEWS EDITOR

Intel gets ahead of itself

At first glance, you might think that Intel is utterly insane. Its new processor, the Pentium 4, has been deliberately designed without everyday office applications in mind. Intel has gambled that this is unnecessary – after all, who’s ever sat in front of an 800MHz Pentium III and thought ‘If only Outlook went a little faster’? Instead, it has focused on making applications such as image editing and MP3 encoding faster.

I’d be interested to see, however, how this will sit with PC manufacturers after the launch. To deliver the kind of results the Pentium 4 is designed for requires a particularly highly specified system, such

until optimised code is released we won’t know for sure.

There’s also another good reason to hold off – chipsets. At launch, all Pentium 4 systems will use Intel’s own 850 chipset, which requires two sticks of expensive RDRAM. The company is currently working on a new Pentium 4 chipset that will support PC133 SDRAM, with a possibility of DDR support later. VIA also wants to bring out its own chipsets for the platform. The release of these could alter the performance and price of the systems significantly.

On the other hand, there’s always the argument that if you buy a Pentium 4 system now, you’re fully future proofed. When new software is released, you’ll be

The kind of results the Pentium 4 is designed for requires a highly specified system

as the ones reviewed in this section. If you don’t need these kinds of systems, you don’t need Pentium 4, and you’d be better off with another processor. But will OEMs be able to resist the temptation to offer cheaper systems that cash in on the Pentium 4 brand name without being able to deliver its possible benefits? Only time will tell.

The key question for purchasers, though, is whether or not to buy a Pentium 4. Early adopters often seem to lose out in the long run, but with the Pentium 4 there is even more potential for this. The next few months will inevitably bring lower prices as both Intel and system integrators settle down to the serious business of shifting more units. This is true of every new technology, but there are other reasons to hold off from buying just yet.

The NetBurst architecture is brand new and needs software to be specially coded to get the best performance. Unsurprisingly, as the technology has just been released, there isn’t any yet. This could be one of the reasons the processor seems to underperform, but

all ready to roll without the need for more costly upgrading. This argument certainly has its merits, but you’d have to be pretty desperate for a new PC for that scenario to apply to you.

My advice would be that if you can wait a few months longer, do. NetBurst is a very impressive architecture, on paper at least, but our benchmark results demonstrate that one of two possibilities exist. The first is that the processor is simply slow. Intel obviously refutes this, saying that it is the benchmarks that are incapable of testing the Pentium 4 accurately.

This raises a second possibility, that, indeed, the types of applications the Pentium 4 is good for haven’t been released yet, and that over time the power of the new processor will become apparent. Which is true is anybody’s guess at the moment – the most compelling reason to hold off on that purchase for a while longer. This is clearly a question to which we will return to again and again over the coming months, in an attempt to find a definitive answer.

ratings

- ★★★★★ EXCELLENT
- ★★★★☆ VERY GOOD
- ★★★☆☆ AVERAGE
- ★★☆☆☆ BELOW AVERAGE
- ★☆☆☆☆ POOR

Sony PlayStation 2

With its UK release imminent, we look at what the PS2 will offer gamers and movie buffs alike

The original PlayStation rewrote the rulebook of video gaming. Video games used to be considered the pastime of sad geeks with no girlfriends, but the PlayStation changed all that. It did something that had previously been unthinkable – it made video games cool. The PlayStation transformed games into a socially acceptable interest, a subject you could talk about at the pub without fear of ridicule, and something that joined groups of friends as they sat huddled round a TV until the early hours of the morning.

It was this redefining of video games that made the PlayStation such a massive success. Millions of loyal PlayStation fans have been waiting with baited breath for the release of the PlayStation 2, and it's this anticipation that has made Sony's job a very difficult one.

In many ways Sony's problem is similar to the one that faced George Lucas with the release of *Star Wars Episode I* – everyone had been anticipating the film for so long that no

avoid any accidents and it makes it look even better, too.

Although the outside is lovely to look at, it's the inside that's the interesting part. The CPU is a 128bit affair which runs at around 300MHz. This may not seem like a lot by PC standards, but for a console it's a lightning-fast chip. Backing up the CPU is 32MB of RDRAM system memory. The graphics chip runs at 148MHz but it's, surprisingly, only supported by 4MB of video RAM. The SPU2 chip provides up to 48 channels of sound. The embedded DVD drive will spin DVD-ROM discs at four-speed and CD-ROM discs at 24-speed. It will read PS2 CD-ROMs and DVD-ROMs, PlayStation CD-ROMs, music CDs and DVD-Video discs.

Almost as interesting as what's on the inside of the box is the array of ports and connectors on the outside. Surprisingly, Sony has only opted to incorporate two controller ports on the

Setting the PS2 apart from any previous consoles is the inclusion of numerous ports that you'd be more accustomed to seeing on a PC. Just to the right or underneath the controller ports (depending on the machine's orientation) you'll find two USB ports and a FireWire port. These connections open the door to all manner of peripheral opportunities. The fact that you can already get USB ADSL modems is an exciting prospect and could prove Sony right in its decision not to ship with a standard modem, like the Dreamcast.

At the rear is a Type III PC Card slot, again offering all manner of peripheral connection, although this has been replaced with

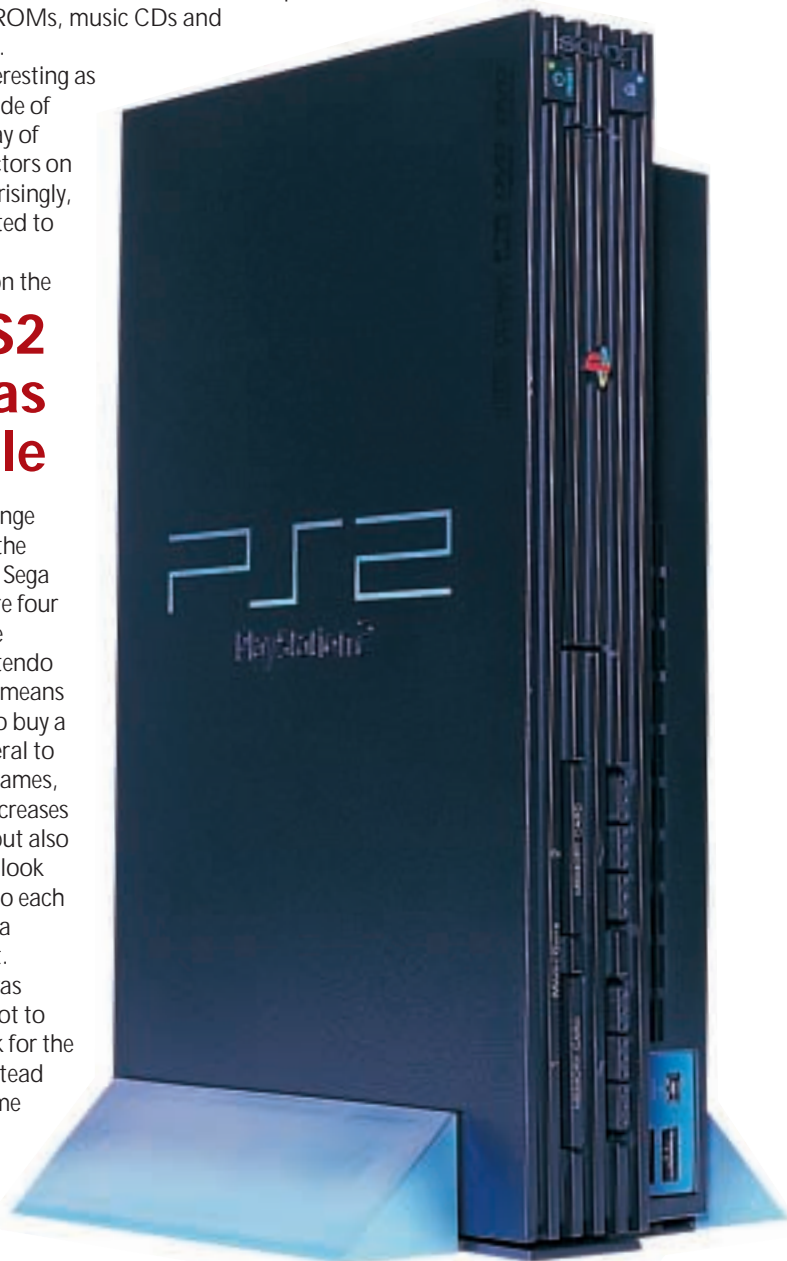
Sony is pushing the PS2 hard as a DVD player as well as a console

matter what Lucas did it would never live up to the expectations. Similarly with the PS2, there has been so much speculation for so long that no matter what Sony delivered some devotees were always going to be disappointed.

The PlayStation 2 should be enjoying its UK launch as this magazine hits the shelves but I've had one for almost six months now. The Japanese launch was back in March and I managed to pick up a machine while on a trip to Hong Kong. So, did the PlayStation 2 live up to my expectations? Well, yes and no. But let's first look at what your £299 will buy you.

There's no denying that the PS2 is a good-looking machine resembling a consumer electronics device rather than a games console, but to be fair to it, it covers both bases. One of the most novel aspects of the design is that it can be used in either horizontal or vertical orientation. Although it will quite happily balance on its side unaided, it's worth investing in the vertical stand to

PS2. This is a strange move since both the Nintendo 64 and Sega Dreamcast feature four ports, as does the forthcoming Nintendo GameCube. This means that you'll need to buy a multi-tap peripheral to play four-player games, which not only increases the overall cost, but also makes the set-up look messy. Adjacent to each controller port is a memory card slot. Another oddity was Sony's decision not to use Memory Stick for the PlayStation 2, instead opting for the same memory card design as the original PlayStation.





You'll find a host of ports on the PS2 – two USB ports and a FireWire port – which will open up opportunities for all manner of peripheral connections

a proprietary hard disk interface for the US version and it's likely to be the same for the UK model. The US PS2 also has an expansion bay at the rear to house an internal hard disk, so it's fair to assume that the UK machine will follow suit. At the rear you'll also find the multi I/O port for connecting the device to your TV, but more interesting is the optical digital connection. This is obviously a necessity for the DVD movie aspect of the machine, but we can also hope for Dolby Digital encoded games in the future, although whether the PS2 is powerful enough to process Dolby Digital in real time remains to be seen. If you have an amplifier that accepts an optical digital connection I strongly suggest that you use it, since the sound is far superior to that produced using a multi I/O cable.

Inside the box you'll find the PS2, a single Dual Shock 2 controller, an 8MB memory card and a composite AV cable. The chances are that the AV cable will be replaced with an RF cable for the UK release. This is a shame since most TVs now have AV inputs and the picture quality through the TV aerial is terrible when compared to a direct AV connection. It's good to see the memory card in the box since it avoids disappointment when you come to save your game and find that you've forgotten to buy a card.

Sony is pushing the PS2 hard as a DVD player as well as a console, and many prospective DVD buyers have been waiting for its release so they can kill two birds with one stone. Of course, this line of thinking is only sound if the PS2 makes a good DVD player.

Whether or not the DVD quality is acceptable depends on your point of view. The DVD playback is surprisingly good, and if you make use of the optical digital output, you can get decent surround sound, too. Ultimately though, the quality of the playback isn't up to the standard of a dedicated DVD player, so anyone who is into home cinema, like myself, would never be happy watching films on the PS2. That said, playback is good and Sony is hoping that the average consumer will be satisfied with the quality.

However, what the average consumer won't be happy with is having to control a DVD player using a game pad. The inclusion of play and stop buttons on the chassis could have helped this situation greatly. On

the plus side though, there are already several third-party infra-red remote controls to turn the PS2 into a more user-friendly DVD player.

As with any machine that's designed primarily around game playing, one of the most important aspects of the PS2 is



There's optical out for DVD and a hard-disk interface in the UK model

the quality of the software, and unfortunately, this is where things aren't quite so rosy. That's not to say that there aren't some good games available on the machine, just that I expected better from such a potentially powerful system. One of the main issues with the PS2 software is a lack of anti-aliasing. This is a graphical technique that smoothes the edges of 3D models to avoid 'jaggies' or stepping effects on rounded or diagonal edges.

The word from certain developers is that the PS2 is hard to code for and effects like anti-aliasing are very difficult to implement. This may or may not be true, but the PS2 is still a new platform and I'm sure that these early problems will be resolved in time. But, anti-aliasing isn't the only problem, there just aren't any early games that make you sit up and say 'wow!'. This is compounded by the fact that games such as Soul Calibur on the Dreamcast still look fantastic.

However, there's no way that I'd count the PS2 out. The developer support is staggering for the platform and the demos of forthcoming games like Metal Gear Solid 2 are nothing short of breathtaking.

Another point that's worth considering is that the PS2 is completely backward-compatible with PlayStation games and it will even make them look (ever so slightly) better. So, if you already have a huge catalogue of PS1 games it could add to the appeal of the PS2.

The PlayStation 2 is an impressive piece of hardware. Sony has put a lot of effort into producing a box capable of more than just playing games. There's no denying that £299 is a lot of money, but there's also little doubt that the PS2 will become the gaming platform for 2001. Even with the X-Box and Nintendo GameCube looming on the horizon, there are just too many PlayStation fans out there for the PS2 not to succeed.

RIVAD EMERAN

DETAILS

★★★★

PRICE £299 (£254.46 ex VAT)

CONTACT Sony Computer Entertainment Europe 0990 998 877

www.playstation-europe.com

PROS Stylish; powerful; plays DVDs; very well connected

CONS Expensive; games don't meet expectations

OVERALL The PS2 will be a success. Once we start to see the groundbreaking games the system is capable of the disappointing early software will be forgotten

Pentium 4 shoot-out

Armari R850 1.5GHz, Dell Dimension 8100 and Hi-Grade Ultis PV4 1.5PWJ vie for the P4 crown

Intel's not had the best of years, what with one thing and another, but with the release of a completely new processor, the Pentium 4, it hopes to change all of that.

AMD has consistently beaten Intel on the price/performance front. Its Athlons and Durons perform either faster or roughly the same as Intel's Pentium IIIs, and they've generally been cheaper as well. In the Megahertz war, AMD has stolen most of the headlines, and recently Intel was forced into an embarrassing recall of its fastest 1.13GHz Pentium III. Intel's 820 chipset was also affected when the Memory Translator Hub (MTH) was recalled. Add to that the fact that Pentium IIIs have been in short supply for the best part of the year, and you're left with a company that could do with a run of luck.

The Pentium 4 is Intel's answer to its critics and is its first completely new architecture since the P6 core, which remains the basis of today's Pentium IIIs, and was introduced with the Pentium Pro.

The new processor will co-exist with the Pentium III for some time to come. Intel will market the Pentium 4 as a high-end processor on the desktop and as an entry-level option for servers.

The design philosophy underpinning the Pentium 4 is important to bear in mind when looking at the processor's performance. Using Intel's marketing speak, the Pentium 4 is designed for the 'visual Internet'. This covers imaging programs, streaming video, speech recognition, MP3 encoding, gaming and video editing.

Intel has come up with a dynamic new name for its latest architecture: no 486, P5 or P6 here. The Pentium 4's architecture is called NetBurst. It has been designed to operate at higher clock speeds than the P6 core, which explains why, at the launch, Pentium 4s will be available at speeds of 1.4GHz and

1.5GHz. Intel has committed itself to ramping up the clock speed of the Pentium 4 to 2GHz by the second quarter of 2001, and there is a clear intention at this stage to take the clock speed even further than that. This makes the architecture underpinning the processor all-important.

For Intel, processor performance is affected by two key stumbling blocks: frequency and the number of instructions processed in a cycle. Increasing both of these has been a key part of the design of the new processor.

also a 256KB Level-two cache, again with high bandwidth.

One of the aspects of the processor Intel is particularly proud of is its support for Streaming SIMD (Single Instruction Multiple Data) Extensions 2, or SSE2. The first SSE is present in Pentium IIIs, and is designed to accelerate certain types of operations. By using only one instruction, several operations can be carried out at the same time. This can increase the speed of applications that use the technology, but they have to be

specially coded to take advantage of it. SSE2 comprises 144 new instructions designed to improve integer and floating point performance. The problem with it is the same as when the original SSE was released - very few current applications take advantage of the

new instructions, so until they are released and you upgrade, you won't see much in the way of extra benefit. Rounding the

architecture off is a 400MHz system bus, which offers a claimed data transfer rate of 3.2Gbytes/sec.

Decent processor design, though, is nothing without a decent motherboard chipset to support the whole operation. At launch, machines are shipping with Intel's own chipset, the 850. The key feature of this is that it has been designed with the Pentium 4's 400MHz system bus in mind. There's no point having a data transfer rate of 3.2Gbytes/sec if the data being transferred hits a bottleneck elsewhere. For this reason, the 850 currently only supports dual-channel RDRAM. Intel claims that this delivers a memory bandwidth of 3.2Gbytes/sec, to go with the 3.2Gbytes/sec system bus.

All of this sounds good, but do Intel's claims on the Pentium 4 stand up? To find out, we tested three of the first systems to use the new architecture. A Dell Dimension 8100, a Hi-Grade Ultis



Dell Dimension 8100

Intel's solution to the first stumbling block is its hyper-pipelined technology. It boasts, for example, that the number of pipeline stages on the branch mispredict pipeline has been doubled from the 10 on the P6 core to 20 on the Pentium 4.

The company's solution to the second problem has been to try to increase the efficiency of the processor, while also reducing the processor's latency. Part of this claimed solution is the Pentium 4's Execution Trace cache. This caches previously decoded instructions, bypassing the main instruction decoder. It has the capacity for around 12K of instructions. Another part is the Rapid Execution Engine that, it is claimed, can deal with basic integer operations much faster than the P6.

Pentium 4s sport a new 8KB Level-one data cache and, it is claimed, this has a very high bandwidth and low latency for speedy operation. There's

PV4 1.5PWJ and an Armari R850 1.5GHz. All of these systems have the highest clocked processor available at the launch, a 1.5GHz Pentium 4.

Dell is the company that has given us the most strikingly different system. It has completely re-designed its silver and black case to meet the needs of the new processor. Inside, the two sticks of 64MB PC800 RDRAM are located underneath the power supply. A Dell 'E' button on the case opens up the company's support centre with shortcuts to Windows Millennium's system restore, help files and Dell's web support page. To address the issue of cooling, Dell has simply mounted a very large silver heatsink on top of the new Pentium 4 processor. Directly behind it is a very large fan, and air is directed over the apparatus by a large green funnel.

Dell has opted for its own custom-made motherboard. This has a removable voltage regulator, located above the AGP slot. A 64MB GeForce2 Ultra with DVI output occupies the AGP slot.

A 40GB Western Digital WD400 hard disk sits in a 3.5in bay. For backup, you can turn to a Sony CRX160E CD-RW. NEC is the supplier of the DVD drive, a DV-5700A. Sound comes from a Turtle Beach Santa Cruz sound card, and Dell provides a fairly decent set of speakers too, in the shape of Aztech's MDP 3900 V-W. A V90 modem occupies one PCI slot, leaving three available for future expansion. The board features an

integrated 3Com Ethernet controller, so all the most popular connectivity bases are covered. Usefully, there are four USB ports integrated into the motherboard, although, in common with Armari and Hi-Grade's machines, there's only one serial port. With more and more devices shipping only with USB interfaces, though, this shouldn't be much of a problem.



Hi-Grade Ultis PV4 1.5PWJ

Dell's black 19in Trinitron monitor is excellent and manages a respectable 75Hz at a resolution of 1,600 x 1,200.

Dell supplied the machine with a copy of Windows Millennium – a little odd considering that Intel's target market would probably value Windows 2000 more, but the company could easily install that operating system for you if you wish. Despite the fact that this is the cheapest system here, at £1,948 ex VAT (including delivery), Dell has also squeezed in a copy of Microsoft's Work Suite 2000 that includes the much-

sought-after Word 2000. You also get a three-year warranty for your money.

Hi-Grade, like Armari, has gone for the full-on Intel route, and has managed to put together the fastest Pentium 4 system. That said, it has used a different operating system to Dell and Armari – Windows 98 SE rather than Millennium – which could have tipped the results in its favour very slightly. There is 128MB of RAMBUS memory in this machine, made up of two 64MB PC800 RIMMs, while two further slots remain available.

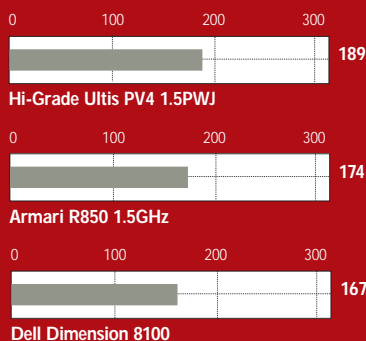
Hi-Grade has used Intel's D850GB motherboard as the basis of its Pentium 4 system. This features the ICH2 chip, which offers support for two USB controllers, AC97 six-channel audio, UltraDMA100 and 10/100 Ethernet.

Hi-Grade has chosen to shun all of these, apart from UltraDMA100 in the form of a 30.7GB IBM Deskstar hard disk. It's a shame that the company hasn't exploited the header on the motherboard to increase the number of USB ports from two to four. There's also a CNR slot on the board, shared with a PCI slot.

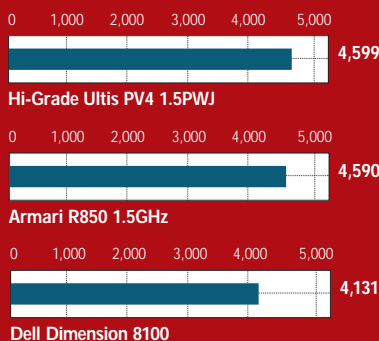
Graphics are supplied by another GeForce 2 Ultra card: the Hercules 3D Prophet II (reviewed on page 93). This has both S-Video and DVI outputs. It supplies its image to the excellent 19in CTX PR960F. VideoLogic's SonicFury sits in a PCI slot, and Hi-Grade has gone for VideoLogic's DigiTheater LC to provide Dolby Digital. The DVD comes courtesy of Hitachi, its GD-7500, with Teac providing a CD-RW 54E. A V90 modem is inside the box, but there's no integrated or additional LAN card. Lotus

PERFORMANCE RESULTS

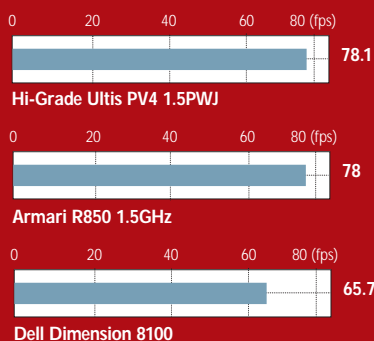
SYSmark 2000



3DMark 1,280 x 1,024 32bit



Quake III 1,280 x 1,024 32bit



SmartSuite Millennium is bundled, along with Norton AntiVirus and Ghost. Hi-Grade offers a three-year warranty on the machine and will install Millennium for you at no extra cost.

Armari has a reputation for making quality workstations, so it came as no surprise to us that its R850 1.5GHz shows off the Pentium 4 to full effect. This is around £1,000 more expensive than the Dell, but is fantastically well built.

Some of the extra money can be accounted for by two factors: the memory and case. Armari has gone for a whopping 256MB of memory, made up by two 128MB PC800 RIMMS. This really helps the machine to fly, and is in keeping with the Pentium 4's ambition to be a high-end multimedia powerhouse.

There'll be no problem with cooling: Armari's CoolerMaster case has an impressive four fans in addition to the main system fan. Two are mounted at the front of the case, blowing straight on to the hard drive bays. This should help keep even the hottest drive spinning for longer. A third fan is mounted at the rear, with the fourth sucking air out of the case.

The GeForce 2 Ultra makes its third appearance here, with Armari opting for the Creative 3D Blaster (reviewed on page 93). A huge 61.4GB IBM Deskstar drive sits in one of the 3.5in bays, leaving a massive four hard disk bays free for future expansion. The new Creative Live! Player 5.1 occupies a PCI slot, while a set of decent Creative Sound Works CSW Digital speakers and a 6 x 4 x 24 Ricoh DVD/ CD-RW combo drive are also supplied. A 19in Lacie electron 19 blue monitor and an Intel 10/100

Ethernet card complete the system.

It's a little tricky to evaluate the performance of these machines at this stage, mostly because applications that take advantage of aspects of the new architecture, such as SSE2, haven't been released yet. Considering the headline-grabbing clock speed of the processors inside them (1.5GHz), you might expect something special. However, all three performed poorly under

deliver on its promises, they do offer a glimmer of hope.

One of Intel's claims, that the Pentium 4 is the ultimate games platform, doesn't seem to stand up. On our evidence, the processor is not as impressive as Intel would like it to be. All three machines here were beaten by the Panrix AMD DDR system reviewed on page 82. Again, though, this may change when SSE2-optimised games come along.

One of the key NetBurst claims is its high memory throughput. To test this, we ran the SiSoft Sandra 2000 standard memory

benchmark. It certainly showed that the Pentium 4s have a very high memory bandwidth – all three machines scored around 1,400Mbytes/sec, compared to 328Mbytes/sec on

Viglen's 1GHz Pentium III system in this month's group test, and 569Mbytes/sec on the Panrix AMD DDR system on page 82. This feature will come into play more as the clock-speed of the processor increases, but nevertheless it is an encouraging set of results.

Intel also provided us with a set of benchmarks designed to show off the power of the Pentium 4 processor. Using these, we were able to determine that, in line with our other tests, the Dell Dimension 8100 is the slowest machine by a fair way, with the Armari and the Hi-Grade neck and neck. Ultimately, it's probably better to wait, but if you want to be an early adopter, all three of these machines have their plus and minus points, as detailed below. As for the Pentium 4, only time will tell if it can deliver what it promises.

JASON JENKINS



Armari R850 1.5GHz

SYSmark 2000, which is usually a pretty accurate gauge of how machines perform in real-world situations. We're used to seeing machines score over 200, yet none of these do. Intel's explanation for this is simply that the processor is not designed for some of the applications SYSmark runs, and to an extent, it is right. We don't really need our word processors to go any faster, and it's certainly the office applications that suffer most under this benchmark. Some of the SYSmark apps (turn to page 190 to see a full list) do fit the bill though. Windows Media Encoder 4.0 absolutely flies using this processor – its individual score was consistently over 300. Dragon NaturallySpeaking and Bryce don't do badly either. So, while these results certainly don't prove that Pentium 4 can

DETAILS

★★★★★

ARMARI R850 1.5GHZ

PRICE £3,582.58 (£3,049 ex VAT)

CONTACT Armari 020 8993 4111

www.armari.com

PROS Excellent integration of the technology; lots of memory; good performer

CONS Expensive

OVERALL This workstation shines in every way, but it will hurt your pocket most

DETAILS

★★★★★

DELL DIMENSION 8100

PRICE £2,288.90 (£1,948 ex VAT)

CONTACT Dell 0870 907 5664

www.dell.co.uk

PROS Good value; excellently designed case

CONS Slow

OVERALL The best value system, but its poor performance robs it of a star

DETAILS

★★★★★

HI-GRADE ULTIS PV4 1.5PWJ

PRICE £2,348.83 (£1,999 ex VAT)

CONTACT Hi-Grade 020 8532 6111

www.higrade.com

PROS Good value; good speakers; good performance

CONS Lacks the integrated appeal of the other two

OVERALL A good Pentium 4 system, but needs a bit of a polish to get five stars

Panrix Magnum Ultra 1.2G

If you're looking for the fastest PC available, you've found it in this updated Athlon system

Not to be overshadowed by the launch of the Pentium 4, AMD also has a trick up its sleeve, but rather than releasing a new generation of chip it's updated its current Athlon platform. From its inception the Athlon has had a 200MHz front-side bus (FSB) at its disposal but it's always been held back by standard PC100 SDRAM, although more recently things have got better with the VIA KT133 chipset supporting PC133 SDRAM. Now, not only is the full bandwidth of the FSB being realised, it's being superseded. All this is being made possible by the introduction of DDR (Double Data Rate) system memory. DDR memory has been around for quite a while, but it's generally only used on graphics cards. DDR memory can be addressed at the rise and fall of each clock cycle, theoretically doubling the bandwidth over conventional single data rate memory.

Panrix is the first manufacturer we've seen to supply a retail system based on this new technology, which isn't a big surprise since the Leeds-based integrator is regularly at the cutting edge of the market. Unlike the demonstration systems we've seen from AMD directly, this Panrix uses a motherboard that only employs half of AMD's new 760 chipset. The 760 is made up of two chips, the AMD-761 Northbridge and the AMD-766 Southbridge. However, the Gigabyte GA-70X only incorporates the AMD-761 Northbridge and marries it to the VIA 686A Southbridge. Although this seems like an unusual configuration it's nothing we haven't seen before. Early first-generation Slot A Athlon boards also used a split AMD/VIA chipset.

As well as the mix-and-match chipset, the Gigabyte board sports two DDR SDRAM slots, one of which is filled with a 256MB module of PC2100 DDR SDRAM. A 1.2GHz Athlon with a faster 266MHz FSB, currently the fastest

Athlon chip available, occupies the Socket A. Making sure the maximum performance can be squeezed out of the system, Panrix has slid a Hercules 3D Prophet II Ultra into the AGP slot. This card is based on the fastest graphics chipset known to man, the nVidia GeForce2 Ultra. With 64MB of

five PCI slots. This card has onboard Dolby Digital processing. Panrix has opted for a set of Cambridge SoundWorks Desktop Theatre 5.1 speakers. All in all you've got a more than adequate sound system that should make watching DVDs quite enjoyable. You also get a Hauppauge Win-TV card and remote, together with a Gravis Blackhawk joystick.

The final expansion card is a Diamond SupraExpress modem.

Although this is a feature-packed system, potential buyers will be most interested in the performance – and this Panrix is the fastest production machine we've seen at PCW. With a SYSmark score of 212 it should fly through any applications you throw at it. That said, the demonstration 1.2GHz DDR machine we sourced from AMD scored 222, but that was using the full AMD 760 chipset.

We couldn't get the Panrix to run 3DMark, but in the Quake III test it turned in a score of 54.1fps at 1,600 x 1,200 in 32bit, which is nothing to be sneezed at.

It looks like AMD has taken a strong lead in the x86 performance stakes, and if you're after the fastest machine around, this should be top of your list.

RIYAD EMERAN



DDR SDRAM running at 358MHz and a core CPU speed of 250MHz, this card will chew up anything you throw at it and spit it out without breaking a sweat.

Making the most of the cutting-edge graphics card is a Mitsubishi Diamond Plus 91 monitor based on a 19in Natural Flat Diamondtron tube. Running a resolution of 1,280 x 1,024 you're treated to a crystal-clear display with vivid colours and sharp geometry.

You're unlikely to run out of storage space for a while with a 61GB IBM DeskStar hard disk fitted. Unfortunately the motherboard doesn't support UltraDMA100 so the bandwidth of the drive is limited to 66Mbytes/sec. That said, it's unlikely to be an issue in a single-disk system anyway.

Connected to the secondary EIDE channel are a 16-speed Pioneer DVD-ROM drive and Plector's excellent Burn-Proof CD-RW drive. This provides 12-speed CD-R and 10-speed CD-RW writing along with 32-speed CD-ROM reading. Its BurnProof ability also allows you to multitask while you're creating CDs.

There's been no skimping in the sound department with VideoLogic's SonicFury sound card filling one of the

DETAILS

★★★★★



PRICE £2,936.33 (£2,499 ex VAT)

CONTACT Panrix 0113 244 4958

www.panrix.com

PROS Fastest machine ever; feature packed

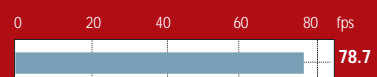
CONS Expensive

OVERALL If you want the fastest PC available, this is it

PERFORMANCE RESULTS



SYSmark 2000



Quake III*

* Quake III is tested at 1,280 x 1,024 32bit colour and textures

Compaq iPaq vs HP e-pc

Two compact and easy-to-maintain Internet PCs are put to the value for money test

Both Compaq and Hewlett-Packard have new PCs, and both are aimed at the network and Internet user who wants little more than this out of their machine. Compaq calls its machines iPaq – without any other designation – while HP uses the brand name e-pc.

Styled in silver and black plastic, the iPaq stands vertically, looking like a miniature office block from central Chicago. The central column, which rises above the two outer cheeks, is frosted silver with a power button at the top, light indicators for power and hard drive activity below, and at the bottom sockets for mic, headphones and twin USB ports.

There are three more USB ports at the back of the iPaq, but no serial or parallel ports. If you have legacy parallel printers or serial devices, you'll need to use external converters to connect them. There's also no built-in modem – even though the iPaq system is designed for Internet use. The intention is that you link to a network – an Ethernet port is standard – and use a network gateway to reach the outside world.

Aimed at the same market as the e-pc, the iPaq is intended as a simple, easy-to-maintain PC that can be added in large numbers to business networks. It's also designed to be secure from unauthorised changes to its configuration.

Where Compaq has gone for an all-new approach, though, HP has been circumspect and provided more support for legacy hardware with its e-pc. This is evident on the back-panel, where there are serial and parallel ports, as well as twin USB sockets. Keyboard

and mouse are connected through PS/2 sockets, rather than USB, so two USB ports should be enough. An Ethernet port is provided as standard.

The e-pc is considerably smaller than the already compact iPaq, measuring just 89 x 239 x 272mm when standing vertically in the stand provided. These discrete dimensions are achieved in part by excluding the power supply and modem from the box. The power supply now becomes an in-line black brick, which makes it easier for HP to sell the e-pc internationally, although more untidy for users.

even for Windows 2000 Professional, which comes pre-installed. There's one memory slot vacant, so you can take the memory complement up to its maximum 512MB.

A Celeron 633 is the powerhouse of the e-pc and is cooled by a novel clip-on fan which is considerably bigger than the top of the chip itself. Again, this makes maintenance easier, as you don't have spring clips and silicon creams.

There's room in one side cheek of the iPaq for a notebook-style CD, DVD, LS120 Superdisk or second hard drive, though none is fitted here. The units

Compaq provides are those used in the company's Armada notebooks, so there's scope for sharing devices between notebook and desktop. There's no floppy drive and no way to fit one unless you use an LS120 or an external USB device. As supplied, the machine is totally dependant on its network link to load software or transfer files. It's intended for use in a business environment, though it would possibly be suitable for school or even a well-heeled home network.

Inside the iPaq, there are no expansion slots, so you're stuck with the hardware supplied. The hard drive is an 8.7GB Maxtor device. The drive is in a quick-release cradle inside the right cheek of the machine and would be very simple to replace if you need more storage space.

On the gently curved, grey-blue front panel of the e-pc there's a single slot containing a notebook-style, 24-speed CD-ROM drive, a power button and indicators for power and hard drive activity. The PC can be run upright or laid on one side and the cream and blue case can be easily removed for maintenance. There's also a large, slide-off panel on one side for quick access to the hard drive. This 10GB Seagate device is fitted with a quick-release handle to make it still easier to upgrade.

This easy maintenance theme runs through the design of the e-pc, with



HP calls the modem an e-modem, and describes it as 'the industry's smallest modem' and as 'entirely within the cable'. A modem riser card, though, is considerably smaller than this. We'd also take issue with the phrase 'entirely within the cable'. The 56K, V.90 e-modem certainly is a neat device, but transpires as a sausage-like bulge that fits at the end of a USB cable.

The iPaq reviewed here is the middle of three specifications, from Celeron 500 at the low end to Pentium III 733 at the top. This one is based on a Pentium III running at 500MHz. It has 128MB of RAM, which is a healthy complement,

panels and devices unclipping rather than relying on screws. Under the CD drive, for instance, a thin metal screen pops out to reveal the memory slot. There's unfortunately only one of these, so you'll need to abandon the 128MB module already fitted if you want to increase the e-pc's memory.

the optional dedicated 4MB on the system board. It also runs out to a 15in TFT monitor, which can be pivoted through 90 degrees to offer both landscape and portrait orientations. The extra portrait mode is very useful for those word processing on A4 paper or reading long website pages, as you can fit much more on screen.

Compaq's keyboard has a good, well-sprung feel and extra keys for Internet functions and for calling up Search and Favourites.

HP's keyboard and mouse combination is fairly standard fare, with a Logitech mouse coupled to an Internet keyboard. This



Compaq supplied its own TFT 5005, a 15.1in TFT flat-panel monitor. A conventional CRT monitor is also available. This is an analog device, but gave a good picture, clean and evenly illuminated by the backlight. You can adjust all the usual parameters with an on-screen menu and separate plus and minus keys. There's also a function which automatically adjusts the size and position of the picture to fit the screen. In most cases, this worked well to handle screen resolution changes. The native resolution of the flat panel is 1,024 x 768, and the device was quite happy at this setting.

The screen did display some line artefacts, taking the form of thin black lines that flickered momentarily across the screen when you were busy with the mouse, but these disappeared when the refresh rate was reduced below 75Hz. The iPaq comes with a one-year, on-site warranty.

The e-pc's graphics display is provided by Intel's 810 chipset, which allocates the memory it needs dynamically from the main 128MB memory pool, but is also fitted here with

unit has six extra function keys, all configurable, but with three preset to functions such as launching your email program.

Performance results are interesting, as they pitch the Pentium III 500 against a Celeron 633. You might expect the Celeron to win out, but the iPaq scored 110 on SYSmark 2000, performing better on office productivity than Internet content. The e-pc scored 101 but did marginally better at the Internet tasks. Both scores are good enough to prevent any serious problems when running the kinds of applications these PCs are designed for. The benchmark, like any external software, had to be loaded on to the iPaq across a network.

A good software bundle supports the e-pc. A copy of Works 2000 is pre-installed, but perhaps more important is the ease with which you can log on to the Internet and design and promote your own e-commerce site using HP's e-centre and its Trellix page design Wizard. TopTools 5, HP's excellent asset management and net-based diagnostic tool, is also included, to enable remote access to the machine. Unfortunately, the iPaq only has Windows installed – there's no extra software.

For a PC costing nearly £1,600, including the monitor, the iPaq doesn't represent particularly good value. There's certainly a place in the market for a simple PC that can be connected quickly and easily to a network to give fair performance.

However, with much less inside the box, you'd expect to pay less, too. Admittedly, the LCD panel adds a lot to the price of the overall system, but £645 for the iPaq is still on the dear side.

The e-pc is a better attempt at an integrated Internet PC, because it takes a more pragmatic view of the way most companies will want to protect their investment in costly peripherals, like printers and scanners. It's also better supported with network and Internet software and the complete proposition, despite £845 for the LCD display, is easier to justify.

CHARLES MICHAEL

DETAILS

COMPAQ IPAQ LEGACY-FREE DESKTOP

★★★★

PRICE £645 (£549 ex VAT) 15in TFT £926 (£788 ex VAT)

CONTACT Compaq 0845 270 4000

www.compaq.co.uk

PROS Small footprint; can share devices with Armada notebooks; secure network device

CONS Very limited expansion; expensive for the specification

OVERALL Compaq's iPaq is limited by its 'legacy-free' status to being little more than a network terminal, and a pricey one

HEWLETT-PACKARD PC2761

★★★★★

PRICE £680 (£579 ex VAT) 15in LCD £845 (£719 ex VAT)

CONTACT Hewlett-Packard 08705 474 747

www.hp.com/uk

PROS Some legacy support; pivoting LCD monitor; TopTools included

CONS External power supply and modem

OVERALL HP has taken a more pragmatic approach for its neatly designed e-pc and has included support for legacy devices, such as parallel printers

PERFORMANCE RESULTS



Compaq iPaq SYSmark 2000



HP e-pc SYSmark 2000

IBM Thinkpad X20

This stylish ultra-portable offering from IBM has an excellent ergonomic keyboard

Any decent notebook manufacturer worth its salt must have an ultra-portable in its range, and IBM is no exception. The likes of Sony have led the way in this, producing models that are not only stylish but also highly functional. IBM's offerings, until now, have been looking a little long in the tooth, but with the X series, IBM hopes to once again take the lead in the sub-notebook.

The X20 is certainly very compact, weighing a very light 1.55kg. IBM has played safe in the design – the X20 maintains the same look as all Thinkpads. It's something that you either like or don't like, but it can't be denied that the design of the X20 makes it extremely robust. The lid is a Titanium composite and this helps to protect the screen and keyboard from damage. There are several models in the X20 range and they all differ slightly, but for this review we looked at the TX031UK.

The key to any good notebook is ergonomics, and here IBM wins hands down. The keyboard is simply the best there is: the near full-size keys have just the right amount of travel, are very responsive and feel extremely comfortable to type on. The 12.1in TFT screen is fairly good and has a native resolution of 1,024 x 768. There are a couple of small dark patches in the top-left and right-hand corners of our review model, but nothing that would affect your viewing pleasure. There's a D-SUB connector at the rear of the Thinkpad for an external monitor, and this supports resolutions of up to 1,600 x 1,200. Graphics are supplied by a 4MB ATI Rage Mobility M chip. As with all notebooks, you can swap between displays using a keyboard shortcut. There are also three dedicated volume shortcut keys, and a Thinkpad key that brings up help files and configuration utilities for the X20. There's also an extra selector button – if you hold this down, you can scroll through the current window using the Trackpoint.

Underneath the Thinkpad's robust shell is a mobile Pentium III, clocked at 600MHz. Along with all recent releases

from Intel, this features battery-saving SpeedStep technology. With mobile processors now running as fast as 850MHz, this may not seem all that impressive, but for the kind of applications this

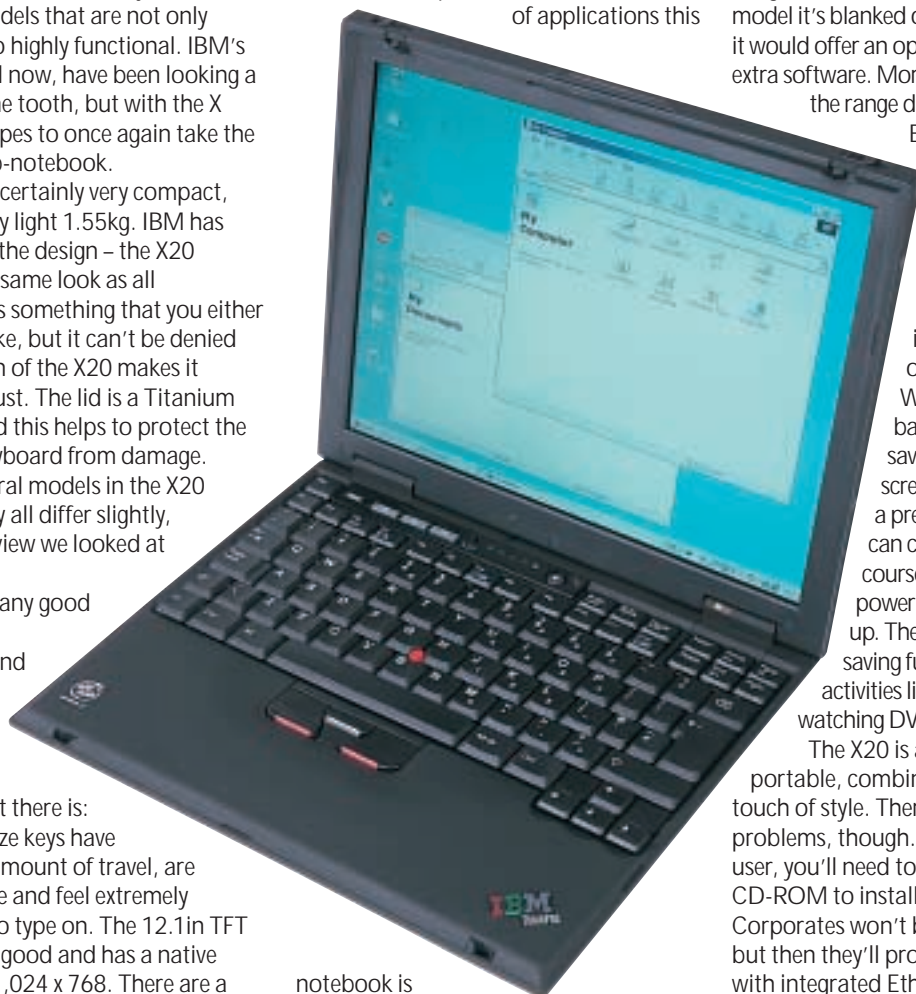
need to buy a PC Card Compact Flash adaptor.

The port for the integrated V90 modem is at the rear. There's space for integrated Ethernet as well, but on this model it's blanked out. This is a shame, as it would offer an opportunity to install extra software. More expensive versions in the range do come with integrated Ethernet, however.

The lithium-ion battery has a quoted battery life of three hours. IBM has its own power management software in addition to that offered by Windows 98. When the X20 is on battery power, it helps to save it by turning off the screen and hard drives after a preset period of time. You can customise this, of course, or use one of the power profiles IBM has set up. These adjust the power-saving functions to optimise for activities like presentations or watching DVD movies.

The X20 is an excellent ultra-portable, combining ease of use with a touch of style. There are a couple of problems, though. If you are a home user, you'll need to add the cost of a USB CD-ROM to install any software. Corporates won't be so worried by this, but then they'll probably want a version with integrated Ethernet. It's for these reasons that we have deducted a star.

JASON JENKINS



notebook is designed for, it's more than adequate. The 128MB of RAM is a healthy addition, resulting in a decent SYSmark 2000 score of 118.

To keep the unit small, there are no internal drives. A USB floppy and CD-ROM are available as optional extras. There are two USB ports for this purpose. In the box is a claim form for Lotus SmartSuite Millennium. For £9.99, IBM will send you a copy on CD. Without paying for the CD-ROM drive, though, most people will have no way of installing the program.

Other ports are few and far between. There's a line in, headphone and mic connectors. But that's it. A Type II PC Card slot is on the left-hand side, and there's also a Type II Compact Flash slot. Unsurprisingly, this can take IBM's own Microdrive, and removes the

DETAILS

★★★★★

PRICE £2,064.48 (£1,757 ex VAT)

CONTACT IBM 0870 010 2512

www.ibm.com/uk

PROS Excellent keyboard; light; Type II Compact Flash slot

CONS No CD-ROM drive included; needs integrated LAN

OVERALL A very good ultra-portable, but the Sony Vaio PCG-Z600NE still reigns supreme

PERFORMANCE RESULTS

0 100 200 300



SYSmark 2000

Apple iBook SE

Apple can now finally offer all your power processing needs in a mobile format

Though hugely popular, Apple's iBook range has suffered from the perception that it's not really a serious computer. This is less to do with its styling than its lack of power features, compromises Apple was forced to make to keep the price down.

But with this second revision of the iBook, Apple finally seems to have delivered the promise of real power in a laptop at an affordable price and with styling that, whatever your opinion of it, is inarguably bold, innovative and guaranteed to get you noticed.

The new iBook is available in two basic configurations. The standard model, available in Indigo and the new Key Lime colour scheme features a 366MHz processor, 10GB hard disk and 64MB of RAM. The iBook SE, reviewed here, comes in Graphite and Key Lime with a 466MHz processor, 10GB hard drive and DVD-ROM drive. Custom options include more RAM – up to a maximum of 320MB, and a 20GB hard drive, both of which will be necessary options for anyone with movie-making aspirations.

Our Key Lime iBook came with the 20GB hard drive, which translated to 18.62GB of usable space and this, like the memory, can be specified when you order online from the Apple store. Don't waste your time looking anywhere else for a Key Lime iBook SE since it's only available directly from Apple, though the Graphite models can be obtained from Apple dealers.

The design innovations for which the iBook has become famous – latchless clamshell casing, integral carrying handle and pulsating power cable – all remain unchanged. The texture of the case exterior has assumed a gloss finish – or as Apple would have it, 'snow accent' – and the inside is matt finished with a large unbevelled trackpad centrally located below the keyboard.

With a significantly more powerful CPU, bigger hard drive, DVD-ROM and a new FireWire port, the iBook becomes a realistic option for Mac fans who would previously have considered nothing less than a Powerbook. Development of the

latter has been in low gear for the past 18 months, largely as a result of Apple's failure to come up with a mobile version of the PowerPC G4 processor, or break the 500MHz barrier with the G3. The iBook has now all but caught up.

The FireWire port means that the iBook can now

a 466MHz version that has 256KB on-chip frontside cache running at the same speed, provides a big performance boost. The 4MB ATI Rage Mobility 128 has been replaced with an 8MB Rage Mobility 128 which, though not cutting-edge in terms of games performance, had no obvious problems with Bugdom and Nanosaur, the two games included in the software bundle.

Likewise, DVD playback was faultless, though, as seems to be the case with many laptops, it proved difficult to get a sufficiently bright screen image. An AV port provides composite video and sound output so you can watch DVDs, or play games on your TV, and it also doubles as a headphone socket. More importantly, this cements the iBook's credentials as an educational machine. The composite out-signal mirrors the iBook's display and can be used, for example, with the presentation module in AppleWorks 6.0 to give a class presentation.

The iBook provides excellent connectivity options. There's an integrated 56K modem, 10/100Base-T Ethernet and USB socket. With the addition of an Airport card, which fits neatly under the keyboard, you can join the world of wireless networking.

The iBook is undoubtedly rugged,

functional, powerful and fun, and it may even be beautiful. Having to pay an extra £350 for sufficient RAM and disk space to edit a modest home video hurts a little, though, and the lack of screen space is irritating, but in every other respect the iBook has come of age.

KEN MCMAHON



be used, like the iMac, as part of a digital video-editing suite. Accordingly, Apple is bundling iMovie 2, the revised and more powerful version of its basic movie-editing application. The port can also be used to connect one of the growing number of FireWire peripherals, including external hard disks and CD-RW drives.

While this can only broaden the iBook's appeal, for many the 12.1in TFT screen – limited to a maximum resolution of 800 x 600 pixels, will be an obstacle to serious movie editing. By comparison with the Powerbook's 14.1in and the lavish 15.1in proportions of some Sony Vaio models, the iBook offers a distinctly second-rate viewing experience whether browsing the web, editing digital video, or watching DVD movies.

Replacing the 366MHz PowerPC with

DETAILS

★★★★★



PRICE £1,908.99 (£1,624.48 ex VAT)

CONTACT Apple 0800 783 4846

www.apple.com

PROS Fast; good looking; DVD; FireWire

CONS Cost mounts with essential add-ons; small screen

OVERALL A huge improvement on the original iBook specification. Give it a bigger screen and we'll stop complaining, honest

Handspring Visor Platinum

This update to the visor deluxe packs more of a punch than its predecessor

Thanks to their highly efficient OS, neither Palm nor Handspring palmtops really need the same high specification as a Pocket PC, but that hasn't stopped programmers from coming up with ways in which to overclock their Motorola processors. Such hardware tweaking isn't without risk though, and perhaps as a response to this, Handspring has launched a Visor with a few more MegaHertz – the Platinum.

The Platinum has a 33MHz Motorola Dragonball VZ processor (the same as the new colour-screened Visor Prism), which is, on paper at least, about 50 per cent faster than the 16MHz Visor Deluxe. The screen is

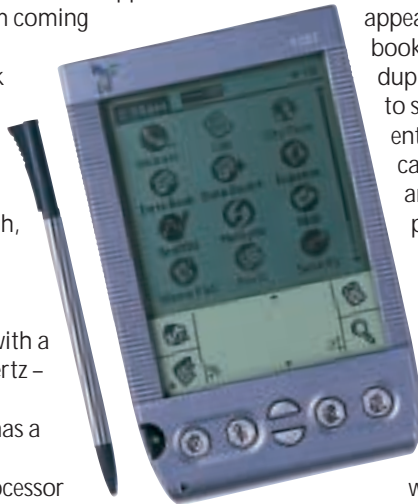
the same decent 4-bit grey as the Deluxe.

Also new is the 3.5 operating system revision, although this hasn't added much in the way of new features. The battery meter now has a 3D appearance and address book items can be duplicated with a single tap to speed up multiple entries. But the Visor still can't communicate with an infra-red mobile phone out of the box (the existing Palm IR patch can be used to achieve this). It's worth pointing out that the Visor's applications are improved versions of the Palm's, and the week view in the calendar is particularly useful.

Despite the higher processor clock rating, the Platinum doesn't feel as fast as a Deluxe model in day-to-day use. A

comparison with a Deluxe containing the same data showed the Platinum to be marginally quicker when starting an application or finding data, but there's no change in HotSync speed. Graphics-intensive games do run more smoothly though, and both the Liberty Gameboy Emulator and V-Rally from Palmtop Software are much more playable.

JULIAN PROKAZA



DETAILS

★★★★★



PRICE £249 (£211.91 ex VAT)

CONTACT Handspring 020 7309 0134

www.handspring.com

PROS Faster processor; 8bit monochrome screen; intuitive OS

CONS Silver case looks cheap

OVERALL If you're about to buy a Palm device and can tolerate the silver case, it's worth paying the extra £50 for the Platinum's extra speed, but there's no compelling reason for existing users to upgrade.

Handspring Visor Prism

The company completes its Palm-rivalling product line with this colourful Visor

Handspring's Visor has quickly become one of the most popular PalmOS handhelds, but if you wanted colour, the only option was Palm's IIIc. That's changed with the Visor Prism, which beats the IIIc by offering 16bit colour – that's 65,536 colours. Like the Visor Platinum, it also has a faster processor than other models. The Prism also has a built-in rechargeable battery, so there's no need to carry spares with you – although you won't be able to use an existing Visor cradle, since the Prism is a little thicker.

The big question for many is whether or not to upgrade. The Prism's speed is

great; browsing *The Guardian* offline using AvantGo becomes much quicker, with pages appearing almost as soon as you select them. For some the extra speed alone will be reason enough to choose a Prism.

Colour, of course, is the big thing. The screen has the same resolution, but the colour does seem to make some text look more grainy than the black and white of before. Of course, being in colour, text is backlit all the time, which makes it more readable in most light conditions. And applications that support colour do look great, like AOL for Palm, the built-in applications, and

Handspring's own PhotoAlbum, which really show off the difference between 8bit and 16bit colour.

However, it's expensive. While add-

ons like the Stowaway keyboard work fine, as do most Springboard modules, some don't. Eyemodule, for example, needs an upgrade. And the Executive case for the Visor Deluxe won't take the Prism, either. Upgraders, then, will be well advised to check what else they need to change. But if you're buying new, and you want colour, this is an excellent – if pricey – piece of kit.

NIGEL WHITFIELD



DETAILS

★★★★★

PRICE £399.50 (£340 ex VAT)

CONTACT Handspring 020 7309 0134

www.handspring.com/uk

PROS Colour display; rechargeable battery; and very fast

CONS Some software and accessories are not yet compatible; a little expensive

OVERALL As power-packed as the original Visor, but faster and with a great colour display, though still a little expensive

Graphics card stand-off

Creative's 3D Blaster GeForce2 Ultra takes on the Hercules 3D Prophet II Ultra

Nvidia's answer to ATI's Radeon, the GeForce2 Ultra, will be on the shelves when this issue hits the streets, and we've tested two of these fast monsters: the Hercules 3D Prophet II Ultra (with DVI and S-Video outputs in the rear) and the Creative 3D Blaster GeForce2 Ultra.

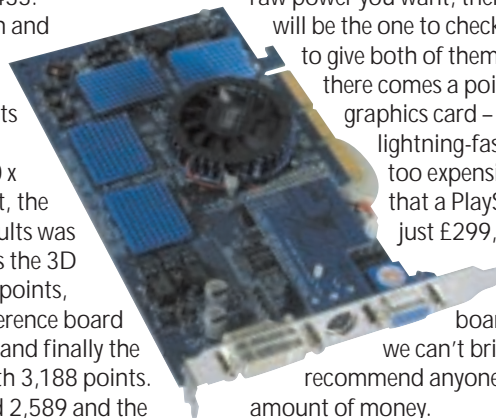
As nVidia's reference board in our preview of the GeForce2 Ultra outlined (*PCW* November, p108), the GPU runs at a blistering 250MHz compared to the GeForce2 GTS' 200MHz, while the memory is clocked at 458MHz compared to the GTS' 333MHz. Ridiculously fast, we think you'll agree.

We compared the two retail boards with nVidia's reference board, ATI's Radeon, and the fastest GeForce2 GTS: Hercules' 3D Prophet II GTS. We ran the same performance tests on the same machine as we used in our graphics card group test in October. We also looked into the full-scene anti-aliasing (FSAA) capabilities of the cards to see if either was producing a high enough frame rate for proper gaming with FSAA turned on. The results are impressive, although they did show a little more variation than we would have expected.

The 3DMark scores – 1,280 x 1,024 in 32bit – straddled the result of nVidia's reference board, which scored 4,385. The 3D Prophet II Ultra scored 4,191,

while the 3D Blaster produced the highest score of 4,433.

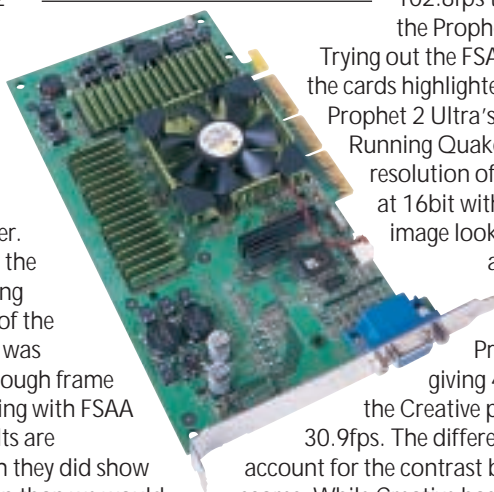
The ATI Radeon and 3D Prophet II GTS produced results around 1,000 points below this. At a resolution of 1,600 x 1,200, also in 32bit, the same spread of results was evident: fastest was the 3D Blaster with 3,372 points, then the nVidia reference board with 3,304 points, and finally the Prophet II Ultra with 3,188 points. The Radeon scored 2,589 and the Prophet II GTS 2,364.



versatility with its connectivity. But if it's raw power you want, then the 3D Blaster will be the one to check out. We'd love to give both of them five stars, but there comes a point when a graphics card – even a lightning-fast one – is just too expensive. Considering that a PlayStation 2 costs just £299, plus the speed that a fast GTS or Radeon board still delivers, we can't bring ourselves to recommend anyone to spend this amount of money.

SCOTT MONTGOMERY

Top: Hercules 3D Prophet II Ultra
Bottom: Creative's 3D Blaster GeForce2 Ultra



In the Quake III tests at 1,280 x 1,024 in 16bit the 3D Blaster produced 102.8fps to 97fps from the Prophet II Ultra.

Trying out the FSAA function on the cards highlighted the 3D Prophet 2 Ultra's strength.

Running Quake III at a resolution of 1,280 x 1,024 at 16bit with FSAA, the image looked excellent, and both cards produce over 30fps: the Prophet II Ultra giving 47.4fps, while the Creative produced 30.9fps. The different drivers used account for the contrast between the scores. While Creative has three different FSAA-quality settings, Hercules has just one. Testing the Creative card at the highest quality setting has clearly reduced its frame-rate scores.

The Hercules board has more

DETAILS

CREATIVE 3D BLASTER GEFORCE2 ULTRA

★★★★★

PRICE £439 (€373.62 ex VAT)

CONTACT Creative

www.europe.creative.com

PROS Extremely fast in 16- and 32bit, multiple FSAA settings

CONS Expensive; only VGA output available

OVERALL For the state-of-the-art in graphics speed, this the card

HERCULES 3D PROPHET II ULTRA

★★★★★

PRICE £449 (€382.13 ex VAT)

CONTACT Hercules 020 8686 5600

www.hercules-uk.com

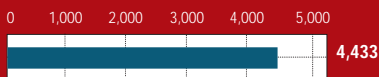
PROS DVI and S-Video out

CONS Not quite as fast overall as the Creative; lack of multiple FSAA settings

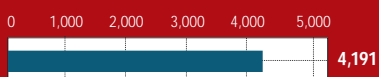
OVERALL The card for those who want speed and connectivity

PERFORMANCE RESULTS

3DMark 1,280 x 1,024 32bit



Creative 3D Blaster GeForce2 Ultra



Hercules 3D Prophet II Ultra



ATI Radeon

3DMark 1,600 x 1,200 32bit



Creative 3D Blaster GeForce2 Ultra

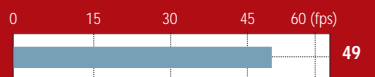


Hercules 3D Prophet II Ultra

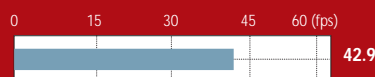


ATI Radeon

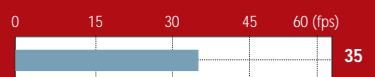
Quake III 1,600 x 1,200 32bit



Creative 3D Blaster GeForce2 Ultra



Hercules 3D Prophet II Ultra



ATI Radeon

ADI MicroScan G900

This offering from ADI falls down on performance and screen quality – good price, though

ADI has released the latest addition to its G Series, the 19in G900, sporting a Hitachi CM901 shadow-mask Pure Flat Tube.

The screen has a flat exterior, although the inside of the tube has a distinct curvature. This has the irritating effect of reflecting the bezel surrounding the tube as well as causing double reflections. However, these are most visible when the unit is switched off.

The G900 is marketed as a high-end model, so we expected to find a selection of connectors around the back. But there are only captive D-SUB and mic output, although you can purchase a USB hub for £20 – this includes one upstream and four downstream ports.

The front of the unit

has a plain fascia, sporting just three OSD controls, two dials for brightness and contrast, and the on/off switch. Using the OSD is easy but a description of what each control actually does would be useful. All the usual options for geometry are present including two for horizontal and vertical linearity. As for colour, there are three preset colour temperatures and three others where the user can define the RGB levels individually. There are no colour convergence controls here – a shame as vertical colour registration

toward the outside of the display was off.

As for screen performance, the G900 has a dot pitch of 0.25mm, a viewable diagonal of 18in and a maximum resolution of 1,600 x 1,200 at 75Hz. This is a little hard on the eyes and most will find 1,280 x 1,024 at 85Hz

more suitable. Image quality is average, although the colour depth can't compete with most aperture-grille units. Focus also suffers in the corners. Geometrically, the screen falls down on corner linearity: the top left and right corners appeared slightly irregular in the fine geometric linearity test, with adjustments having little effect. Power regulation could also be more controlled. Overall, not a great showing but with a price tag of £299 you could do worse.

JALAL WERFALLI



DETAILS

★★★

PRICE £351.32 (£299 ex VAT)

CONTACT ADI 020 8327 1900

www.adieurope.com

PROS Good price; built-in microphone

CONS Internal curvature and reflections; no extra connectors; uninspiring performance

OVERALL A reasonably priced 19in monitor that's let down by the screen's overall quality

Iiyama S900MT1

Good value for your money, but dated in appearance and poor power regulation

Shadow-mask monitors have been around for donkey's years, and this recent model from the well-known Japanese display manufacturer puts this tried and tested technology to good use.

The S900MT1 unit encases the 19in shadow-mask tube with a narrow bezel that helps enhance the apparent size of the display. At £209 this is a 19in monitor for those on a tight budget who want that extra desktop space that a maximum resolution of 1,600 x 1,200 at 75Hz can bring.

There's only a captive D-SUB connector, but this perhaps excusable in this price bracket. Using the four-button

OSD controls, menu navigation is intuitive and much better than the age-old awkward OSD controls still used in many of the higher-spec Iiyama

models. The controls are limited, however, as there's no way to adjust colour convergence, which was slightly out in the vertical plane. A user-defined setting for colour is also restricted to red and blue levels only.

However, all the geometry controls that you'll ever need are embedded within the OSD.

As for our other test results, the S900MT1 fared pretty well, with passes in most areas. Focus was adequate,

geometry commendable, while streaking and ghosting were passed with distinction – indicating that the electronics controlling beam switching were sound. However, in terms of beam intensity they had a looser grip – the power regulation was very poor. This aside, the image is bright and punchy, and at 1,280 x 1,024 at 85Hz is quite acceptable to use, thanks to the decent 0.26mm dot pitch. Ultimately, although the design is a little dated, it does a good job for the price.

JALAL WERFALLI



DETAILS

★★★★

PRICE £245.57 (£209 ex VAT)

CONTACT Iiyama 01438 745 482

www.iiyama.co.uk

PROS Simple yet effective OSD; good price

CONS Poor power regulation; looks dated

OVERALL More monitor for your money, but let down slightly by flippancy power regulation

Motorola v.100

The opportunity of providing mobile voice messaging is wasted here as the v.100 misses the mark

The US is the land of the pager: partly because the mobile phone coverage is so appalling, and partly because mobile phone tariffs mean you pay for incoming calls: mobile phone users want to be paged and then call the person back. From this grew the two-way pager and it's in the light of this that Motorola has created the v.100 – a device that sends SMS text messages, with built-in voice.

And because it's the youth market that uses text messages the most, it comes in a trendy blue or violent green. The result is unimpressive, though.

The 92 x 72 x 25mm (w x d x h) unit is shorter, wider and thicker than a typical mobile phone. It's also light at 125g with a lithium-ion battery giving a quoted maximum of 150 minutes talktime and 125 hours on standby. We think this is the future of mobile phones: voice will be built into pocket computers, games consoles and watches. It also makes sense in the light of the huge success of SMS. There are many people who use voice as a secondary function and who spend more time and money on 'texting'.

Unfortunately, with the v.100, it's all done very badly. The user interface is new to Motorola, but we're not impressed. The v.100 needs lots of keystrokes just to read a message. At each juncture we thought that the next key press would show us the message, only to be presented with another option. This product has been developed with the mindset that everything should have a new name. So, instead of a simple 'read message', we are presented with 'switch view'. 'Incoming message' is mangled into 'MT SMS' for Mobile Terminated Short Message Service. It's not big or grown up, just confusing.

We would have expected room for hundreds of messages which you could put into folders to keep track of who is sending what. The v.100 only uses the room on the SIM and that, for most people, means 10 messages.

Mechanically, it isn't great either:

cool design has been allowed to override functionality. The only way to type on a v.100 is by using one finger, and the pitch is too tight to just use thumbs. Unusually for a pocket device, there's plenty of travel, but the keys feel squidgy, and you need to press down a long way to get a response. To make matters worse, the keys are cramped on the left-hand side.

R-type, and you might think that Motorola is years behind the leading edge with its games.

The WAP browser is the one aspect of the phone that benefits most from the v.100's keyboard, partly because WAP requires you to type – although not very much – and this is easier here than on a standard mobile phone. Even the dot and slash keys are easy to get at. There isn't, however, much advantage in the v.100's wider screen, as most websites are

designed for smaller phone screens.

Generally, though, it makes WAP browsing simpler.

We can't help feeling that the v.100 was developed by people who have no understanding of mobile phones.

Motorola's GSM development takes place in Chicago which has only just installed a GSM network. The phone developers there haven't seen kids in the playground using SMS, and we can only assume that, if they had, they would probably have come up with a radically different product.

Motorola's v.100 is certainly a visionary product, but based on this evidence, we think that, ultimately, the Scandinavian vision will win out in the end.

SIMON ROCKMAN



There isn't really any data support – no IrDA and no PO3 client – and although Motorola claims email support, that's only through WAP.

The v.100 has some games, but in keeping with the ZX 81 keyboard, these games would have been rejected by magazines where you typed the listings in yourself. They include the Towers of Hanoi puzzle game that was a standard Pascal programming example, and a breakout game with only one screen of bricks. Compare this with the new Nokia 3310 that plays a mean game of

DETAILS



PRICE £149.99 (£127.50 ex VAT)

CONTACT Motorola 0500 55 55 55

www.motorola.co.uk

PROS A brave attempt to offer SMS over voice as a prime means of communication

CONS The keyboard and the software are both icky

OVERALL It's quicker to use a phone with T9 predictive text input. If you must have a keyboard then the Ericsson Chatboard is a better solution

Infocus LP350 projector

Cinema-quality projection without the need to turn off the lights, and ceiling mountable too

The Infocus LP350 is one of a new generation of projectors that use a technology called Digital Light Processing (DLP) to provide an exceptionally clear, bright and colourful image in all kinds of environments. DLP is so good, claim its proponents, that you don't need to turn out the lights.

Texas Instruments, the company that developed DLP, hopes it will become the leading technology, not just for mobile presentation devices and big-screen home entertainment systems, but in cinemas too. DLP projection systems are already in use in some UK cinemas – Leicester Square's Odeon being one – and have been used as part of a digital distribution pilot for films like *Star Wars Episode I*, *Toy Story 2* and Disney's *Dinosaur*.

At the core of the DLP system is a Digital Micromirror Device (DMD), which contains thousands of tiny square aluminium mirrors capable of switching on and off thousands of times per second. The mirrors measure only 16 microns square, and the gap between them is less than one micron. It's this almost seamless coverage that provides such a bright, sharp and even image compared to that of LCD-based devices.

The LP350 and its sibling the LP340 are identical in every respect except that the 340 offers a maximum resolution of 800 x 600 (although it will compress 1,024 x 768), whereas the 350's maximum resolution is 1,024 x 768. The slate grey casing, compact dimensions, simple control layout and tidy connector panel combine to produce an elegant piece of equipment that, at 3kg, will probably weigh slightly less than your notebook.

Setup is simplicity itself. Infocus has opted for a DVI connector, allowing for a better quality image if you have the right port. But, as most people don't, the company's standard cable has a D-SUB and USB port on the end. The USB port enables the remote mouse.

There are also connections for S-Video, composite video, sound, and a CableWizard connector. This links to an optional hub that provides mouse, audio, monitor and computer connectors when the unit is ceiling-mounted.

The LP350 auto-senses the input signal and adjusts the

picture approximately five to six feet wide at a distance of 12ft. The zoom is used to make minor adjustments to fit the image to the screen, rather than to produce any significant image magnification.

All the OSM functions can be accessed using the infra-red remote. This has a circular 'disc mouse', four function buttons and two mouse buttons.

There's only one word to describe the quality of the picture – stunning. Used to project DVD video, the results were of cinematic quality with bright, vivid colours, edge-to-edge sharpness and no discernable fall-off in illumination at the corners.

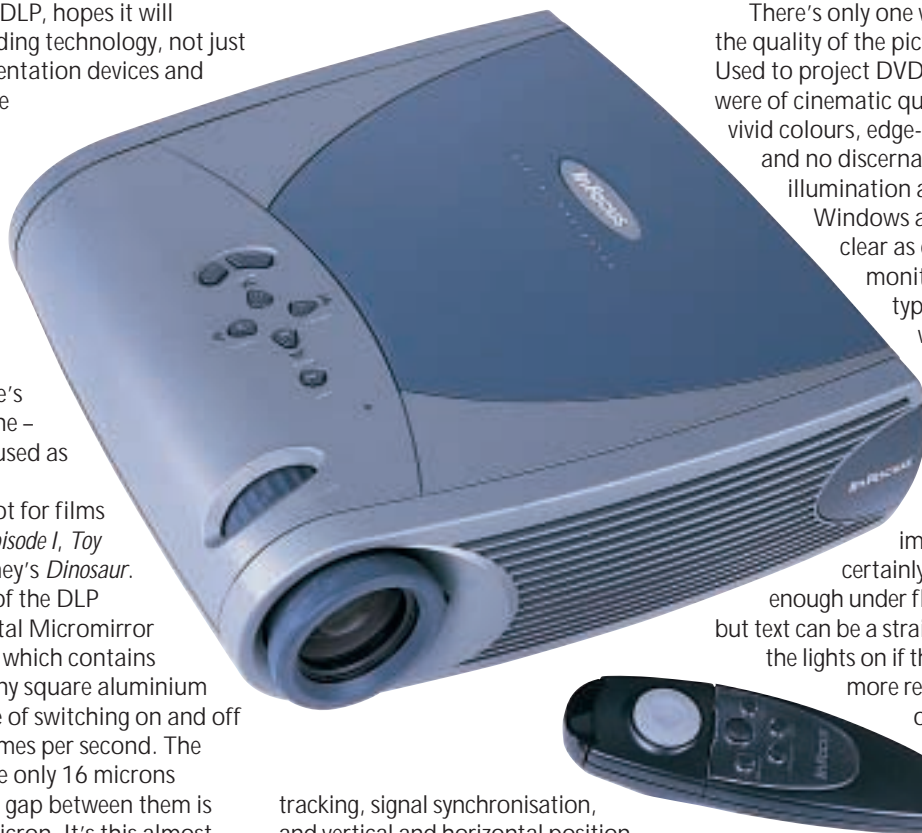
Windows applications were as clear as on an LCD monitor, with icons and type sharp and legible with no evidence of colour halos or other aberrations.

With the lights on, the quality depends on the lights and source image. You can certainly see video well enough under fluorescent lighting, but text can be a strain. No-one will keep the lights on if they don't have to: a more realistic situation is

one where window blinds are incapable of blocking all the extraneous light and in this situation, provided that light isn't shining directly on to the screen, the LP350's 1,300 lumens give it a clear advantage over its LCD competitors.

At £3,995 ex VAT, the LP350's performance comes at a price. We can only hope that, like all good technology, time will work its deflationary magic.

KEN MCMAHON



tracking, signal synchronisation, and vertical and horizontal position, although you can do this manually if you're experiencing problems.

The on-screen menu (OSM) lets you adjust image quality (although in most cases this won't be necessary), sound, and keystone angle – to ensure you get straight sides even when the projector is pointing upwards at the screen. Other configuration options include manual selection of video standard, ceiling and rear projection reversal, standby time, language and status information. The lamp life warning initiates at 2,000 hours but you have a further 50 hours in which to replace it before it reaches 50 per cent of its original brightness.

In reality, the only adjustment you're likely to make frequently is to the lens-mounted zoom and focus rings. Obviously the image size depends primarily on the distance between lens and screen, and the LP350 produces a

DETAILS

★★★★★



PRICE £4,694.13 (£3,995 ex VAT)

CONTACT InFocus 0800 028 6470

www.infocus.com

PROS Superb image quality; lots of connections; ceiling mountable

CONS Expensive

OVERALL A top-quality product that beats the pants off LCD projectors, at a price

Creative SB Live! Platinum 5.1 & DTT3500 speakers

For the ultimate in home entertainment surround sound, Creative has the answer

For a long time now the SoundBlaster Live! Platinum has represented the pinnacle of PC sound cards. The quality of the card, backed up by the plethora of connectivity, made it a dream come true for PC sound enthusiasts. In fact, it was hard to believe that Creative, could have made the product better in any way. But that's exactly what it has done.

The main addition to the feature set is obvious in the new name: it now supports onboard 5.1 channel Dolby Digital processing. This means that an external Dolby Digital processor is not required for the full surround sound effect when watching DVD movies. Since the processing can now be performed onboard, the new card needs six analog outputs as well as all the usual digital in and out connectors. This wasn't too much of a problem for Creative since the standard Live! card already supported two sets of stereo analog outputs for four-point surround effects in games.

What Creative has done is to make the mini-jack S/PDIF output on the card a dual-use connection. As well as carrying a digital bitstream via a convertor cable, this socket doubles up as the analog output for both the centre and subwoofer channels. This is not a new concept since VideoLogic's Sonic Fury sound card (see November issue, p123) used exactly the same solution, but just because an idea is not original, doesn't mean it's not a good one.

The upshot of having a Dolby Digital processor on the sound card is that you can use almost any six active speakers to make up your surround sound stage. That said, any home cinema buff will tell you that it's important to match your speaker set carefully to ensure an

even sound envelope. To cater for this, many speaker manufacturers are now producing 5.1 channel speaker sets without a processor specifically for use with a sound card like this one.

Where this card scores highly

mini-DIN to make space for the IR port, but a mini-DIN to standard DIN cable is supplied in the box.

The beauty of the Live! Drive is that you have all the connections you're ever likely to need within easy access at the front of your PC. For anyone who masters to MiniDisc or DAT, this is ideal.

There's also a blanking plate supplied that has digital DIN sockets, both in and out, making sure that absolutely every base is covered.

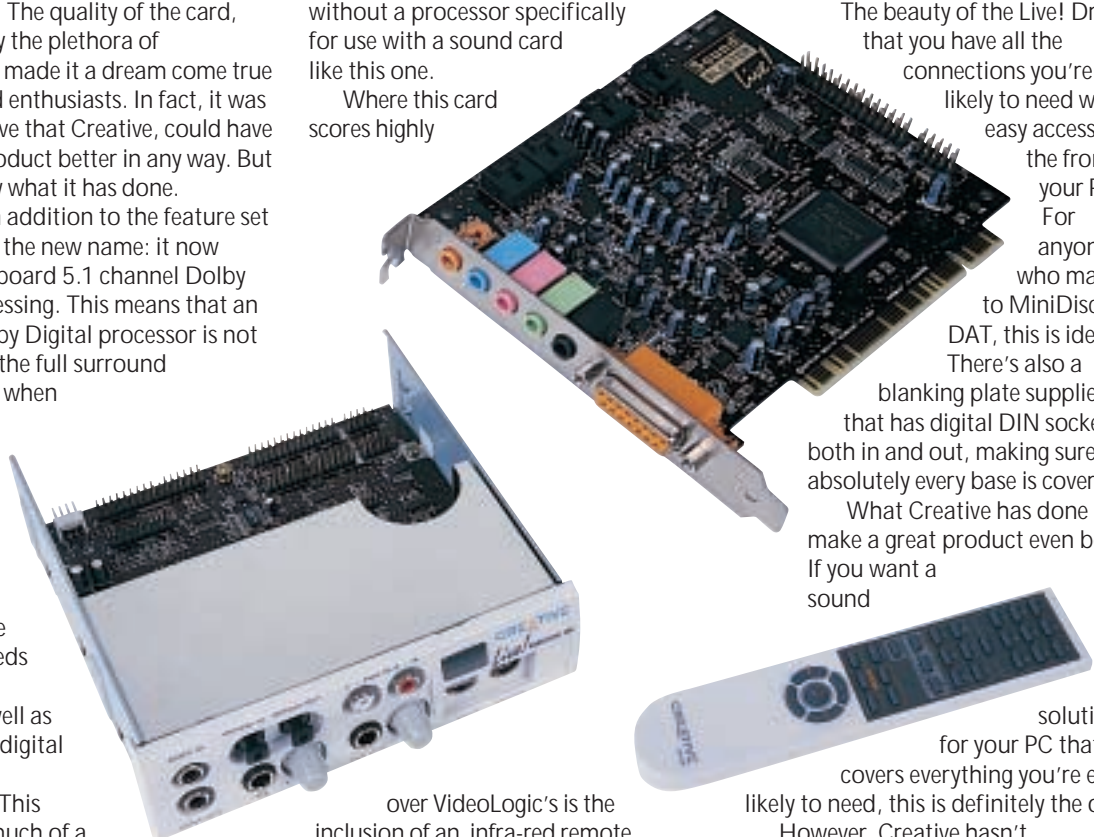
What Creative has done is make a great product even better. If you want a sound

solution for your PC that covers everything you're ever likely to need, this is definitely the one.

However, Creative hasn't concentrated its efforts on its sound cards alone: a whole new line of speakers are hitting the streets, too. Creative has been allied with Cambridge SoundWorks for a long time and the initial speaker products produced by the alliance were quite disappointing. However, perseverance on both sides seems to have paid off because the DTT3500 Digital speakers represent the best audio solution we've seen at PCW.

With these speakers you don't need to use the onboard Dolby Digital processor in a card like the Live! Platinum 5.1 since it comes with a feature-rich processor of its own.

The processor/amplifier is probably the best looking device of its type that we've seen. Resplendent in silver and black, you're also treated to a blue aura that surrounds the main volume dial. But this processor does a lot more than simply look good. At the rear are inputs for optical digital, coaxial digital, digital



over VideoLogic's is the inclusion of an infra-red remote control. This may seem gimmicky at first, but again, any home cinema enthusiast knows that you need to be sitting in the 'sweet spot' (the place you'll be watching from) when you're setting up your amp and speakers, and the only way to do this is with a remote control. The remote will also control the functions of the DVD player so that you won't need to muck about with the mouse every time the phone rings or you want to make a cup of coffee.

The rest of the specification remains the same as the original. At the rear of the card you get front and rear analog stereo outputs, line-in, mic-in, S/PDIF/centre and sub combo jack and a game port. The Live! Drive IR is almost identical to the Live! Drive II. You get coaxial digital in and out, optical digital in and out, left and right analog in, headphone socket, mic socket and MIDI in and out. The only difference is that the MIDI ports have been shrunk to

DIN, analog stereo front and analog stereo rear. Also present are the six speaker outputs and a subwoofer line-out, all gold-plated for optimum connection.

The processor's fascia sports almost as many controls as a dedicated home cinema AMD. Besides the master volume dial there are dials for centre channel, surround channels and subwoofer volumes. There's a selector button for the type of source being used and this can be set to music, movie, four-point/5.1 DIN (this is used for games) and stereo. There's another selector for the type of digital input for Dolby Digital or PCM CD-Audio that switches between optical, coaxial and digital DIN. Below this is a selector for multi-channel audio

for games that toggles between analog line-in and digital DIN. There's also a Dolby Pro Logic setting for matrixed surround sound that can be obtained from either a digital DIN input or an analog line-in.

The five satellite speakers produce a surprisingly good sound considering their size, but the subwoofer lets the whole package down slightly. The main problem with the subwoofer is that it's passive rather than active. This is no doubt a decision that was made to keep down costs, but it's a shame since the subwoofer doesn't really add a surrounding low frequency effect – it instead produces intrusive blasts of muffled bass. That said, you can still obtain a reasonable effect after a lot of fiddling with the speaker levels.

In the box you'll also find a remote control to help you set up and control the sound from your seated position. Also bundled are two optical digital cables, a coaxial digital cable, a digital DIN cable and various analog cables. All in all, Creative has been very generous and given you every cable you're ever likely to need.

Of course, all the cabling in the world won't help if the sound quality is poor, but thankfully the sounds we obtained from the DTT3500 were most impressive. Even with the passive subwoofer we were treated to a very impressive Dolby Digital

could fork out on an active subwoofer and have a near-perfect surround sound setup.

RIYAD EMERAN



performance: the big shoot-out scene in *The Matrix* has never sounded so good on a PC setup. Just make sure that you have the correct source selected: if you've got the processor switched to four-point/5.1 digital DIN, you'll get a very disappointing movie performance. That said, what really impressed us was the multi-channel sound when playing games. The processor will up-mix a stereo or four-point signal into a 5.1 channel aural delight. Streaming your game effects through the digital DIN cable with the Pro Logic processing turned on produces an amazing sound stage that makes your game feel more immersive than ever before.

Creative has produced a truly excellent set of speakers here and even catered to differing aesthetic tastes by allowing the processor to stand either vertically or horizontally. You even get different face plates for each orientation.

If you're looking for a great set of speakers for watching movies on your PC and getting the most out of your games, you can't do much better than these. As with anything good though, this package doesn't come cheap. But if you really have got money to burn, you

DETAILS

CREATIVE SOUNDBLASTER LIVE! PLATINUM 5.1

★★★★★

PRICE £179 (£152.34 ex VAT)

CONTACT Creative

www.europe.creative.com

PROS Everything you need from a sound card and more

CONS None

OVERALL If you want the most versatile sound card around, this is it



CREATIVE DTT3500 DIGITAL SPEAKERS

★★★★★

PRICE Estimated £249 (£211.91 ex VAT)

CONTACT Creative

www.europe.creative.com

PROS Feature-packed; great Dolby Digital sound; superb surround sound for games

CONS Passive subwoofer

OVERALL The passive subwoofer is a disappointment, but the rest of the package is nothing short of amazing



Umax Astra 6450

A consumer FireWire scanner that also boasts its own transparency unit

The Umax 6450 is no ordinary scanner – it has a built-in transparency unit and FireWire. This is usually an optional extra, but Umax has hidden it away in what could easily be mistaken for a standard document cover – the only clue is a 5in-square diffuser in the underside of the lid.

A single FireWire port on the rear connects to your PC using the FireWire card supplied. This has three external ports, leaving two spare. The front panel sports three buttons for one-touch processing and these can be configured for image scanning, OCR, copying, or electronic transmission.

In addition to the drivers, the installer offers the Presto Page Manager document management application,

VistaShuttle, for creating electronic cards, calendars and the like, and OmniPage LE and Recognita OCR. You also get Photoshop 5.0LE.

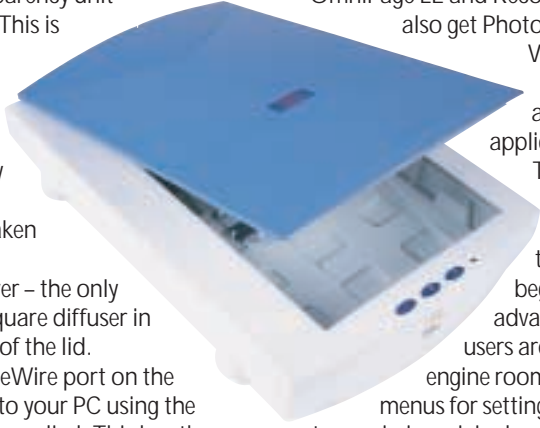
VistaScan 3.73 can be used as a standalone application, or as a TWAIN module from Photoshop. There are two modes – beginner and advanced. Advanced users are let loose in the engine room, with access to menus for setting reflective/transmissive originals, colour mode, resolution, filters, output size and so on.

To scan transparencies you need to be in Advanced mode. The preview scan cleverly isolates and crops the frame. A four-tabbed panel lets you make pre-scan adjustments to levels, curves, colour balance and orientation, although the preview doesn't provide

sufficient visual feedback to make this practical – you're better off doing it in Photoshop afterwards.

The quality of the scans from both prints and transparencies was clean and crisp with good colour reproduction and tonal rendition, although with 35mm transparencies the enlargement factor exposes all kinds of ills. The FireWire link makes light work of big images, digesting a full A4 at 300dpi in half a minute.

KEN MCMAHON



DETAILS

★★★★★



PRICE £249.99 (£212.74 ex VAT)

CONTACT Umax 01344 871 340

www.umax.co.uk

PROS Integral transparency unit; fast; good software

CONS Like all flatbeds, poor results from 35mm transparencies

OVERALL A good all-rounder, with the potential to double up as a colour fax/copier

Umax Astranet iA101

One-touch operation for scanning, copying, faxing or emailing

This scanner is aimed at the home user who perhaps wants to scan family photos or, say, archive a library of photographic prints. It's a USB model with 14bits per channel and 600 x 1,200ppi (pixels per inch) optical resolution.

A one-touch operation is becoming the hot feature for consumer models and Umax has really pushed the boat out, providing no fewer than four programmable buttons on the front panel. You can scan, copy, fax or email from an original using nothing more than the tip of your index finger.

A push-button configuration applet lets you assign functions to each of the four buttons. The copy button can be configured to send the output direct to a

printer, and the custom button can be configured to email or fax a scan.

The fourth button, confusingly labelled 'powersaving', fires up your browser and connects to

www.imageol.com. This is an online personal photo library service to which you can upload images and share them with friends, family and anyone you give access to. Making this facility available as a one-touch option will make scanning and uploading pictures to the web a thing of the past.

In the quality department, the iA101 gave absolutely no cause for complaint, reproducing accurate colour and sharp image detail. In fact it was difficult, if not impossible, to distinguish the results from the more expensive Astra 6450.

Only the most demanding users will be disappointed with the performance – an A4 300dpi scan completed in 50 seconds. And if you're scanning for the web at much lower resolutions and output sizes you're unlikely to be sitting around tapping your foot.

Bundled software includes MGI PhotoSuite III LE, PhotoDeluxe 3.0 home Edition, and VistaShuttle.

KEN MCMAHON



DETAILS

★★★★★



PRICE £89.99 (£76.59 ex VAT)

CONTACT Umax 01344 871 340

www.umax.co.uk

PROS Inexpensive; easy to use; lots of one-touch buttons

CONS The colour of the document cover is pretty outrageous

OVERALL Perfectly suited to operation by inexperienced users. Once configured you can do almost anything at the touch of a button

Dreamweaver 4

Macromedia's industry-leading software looks set to maintain its advantage with this upgrade

It's difficult to argue with Macromedia's assertion that since its introduction in December 1997 Dreamweaver has become 'the industry's leading application for professional web design and production'. Counting over 700,000 in its registered user base, as of summer 2000 it commanded a 78 per cent market share.

Perhaps one of the key factors driving this success is the no-nonsense, easy-to-navigate interface and the fact that nearly everything that goes into its make-up can be customised, which allows end users to run a version of Dreamweaver that precisely matches their needs. While smaller business or more serious home users might not want to go as far as customising the entire menu structure, the launch of Dreamweaver Exchange, a site dedicated to swapping extensions and pluggable functionality, in the first half of 2000 means that developing through Dreamweaver can only get easier.

Of course, this could pose a problem for Macromedia. The value proposition that surrounds upgrading to Windows Me has been severely dented, as many of the must-have features are available for free download from the Microsoft website, allowing Windows 98 users to pretty much run a Me-alike system for the price of a fairly long phone call.

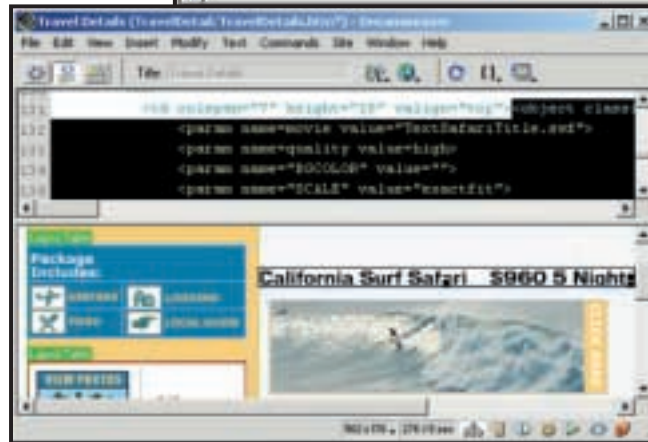
The success of Dreamweaver 4, therefore, depends on Macromedia being able to offer sufficient must-have elements in a tightly integrated and robust platform that will appeal to the serious developer who is less likely to rely on downloading third-party plug-ins to upgrade their primary development platform.

Whether upgrading or starting from scratch, you have a choice of two packages – the vanilla Dreamweaver for web developers, whether working in teams or individually, who might also want to hand-code a certain proportion of the site, or Dreamweaver UltraDev, which is geared more towards the team worker and is designed from the ground up with database-driven sites in mind.



Above: Drawing tables is straightforward in the new layout mode

Left: Split code view allows the designer to have multiple windows open at once



code/design view, allowing you to have multiple code windows open at once, and a welcome enhancement is reliable pasting of code into the document head. Dreamweaver 3 had a tendency to skip out of the head and into

the document body whenever you tried to paste Meta tags from one document into another.

It is also from this new toolbar that you'll have access to Dreamweaver's debugging features that allow you to define break points and debug from within your browser. Many competing titles debug within the application itself, which means you're not going to see a true representation of what will happen when a user pulls down a page from your site. Once the break point has been reached you can drill down through the browser variables as they stand at that point and find where the problem lies.

Coding beginners will welcome the inclusion of online versions of three O'Reilly's books, covering HTML, JavaScript and Cascading Style Sheets. These are interactive, so invoking the reference while your cursor is positioned within a tag will call up the relevant article.

The new layout view dramatically enhances Dreamweaver's table handling

For the lowdown on the latter option, turn to page 108. Here, we turn our attention to Dreamweaver, although as the interface is pretty much the same regardless of which you pick, don't go turning the page just yet.

The Macromedia common user interface appeared in Flash 5 and, as *PCW* predicted at the time, it has been rolled out across the web development product line. Tool palettes look the same regardless of the application you are running, and you can also customise your keyboard shortcuts. The colour picker has been standardised across applications, too. In Dreamweaver, though, a new toolbar across the top of the screen speeds your workflow and you soon find yourself using it without really thinking about it. It is not context sensitive, so doesn't replace the property inspector, but it does make it easy to switch between views, change the page title without going through the Page Properties dialog, and preview the site.

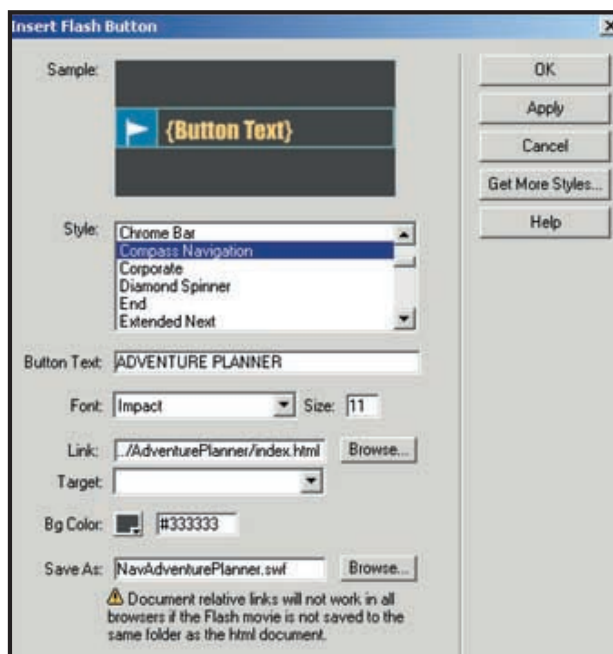
Dreamweaver now includes a split

capabilities. In version three and earlier, tables had to be defined through a dialog box, and if you wanted a few of your columns to span multiple rows you had no choice but to perform a merge. The layout view does away with this, allowing you to draw tables in exactly the same way you'd define frame boundaries in desktop publishing. Cells can be set to autostretch when a browser window is maximised either through the object properties dialog or by clicking the icon denoting cell widths above each column. Cells can be dragged to new positions and the underlying code will dynamically update.

Macromedia claims that 96 per cent of the Internet population can now view Flash content, which puts the format ahead of JavaScript as far as browser compatibility is concerned. Taking advantage of this, and no doubt hoping to push the installed player base to 100 per cent, Dreamweaver can now generate Flash 2-compliant buttons and text. A generous library of buttons has been included ready for you to change the fascia contents, while generating your own Flash text means you can create interactive links to say whatever you want. Flash text is a quick and easy way of generating rollovers since you can set your words to change colour as your mouse passes across them. One idiosyncrasy noted here was that if you want to generate Flash content in a blank Dreamweaver document you first have to save the page, regardless of the fact that it is empty. Perhaps this is a beta bug to be ironed out before its release.

You now have somewhere to store your assets. The new assets panel is split into sections, letting you keep animations, film, scriptlets and anything else you might want to re-use without getting them mixed up. An integrated viewer lets you see what each asset name relates to, and moving content can be invoked so a Flash animation, for example, will perform any relevant mouseover tasks. You can define a set of favourites for each category, making it easy whenever you want to come back to them at a later date. For the first time, too, this provides a space to keep any colours already in use. This colour tracking feature has been a part of Microsoft FrontPage for some time now and it is an effective way of ensuring that every time you use a red it's the same shade. Assets can be dragged out of the palette and dropped onto the page, which immediately cuts down on coding.

Table code is fully interchangeable between Dreamweaver and Fireworks, so any changes you make in one package



Dreamweaver can now generate Flash 2-compliant buttons

will be reflected once you load it into the other. Dreamweaver will even denote within the property inspector a piece of selected code, say a table, which was generated in Fireworks. The two packages are so tightly integrated that Dreamweaver's property inspector even has a dedicated button for porting selected graphics into Fireworks for editing, and once there the edit window adopts a 'done' button that will save the graphic and take it back to your page. We were disappointed that in our review code Fireworks was unable to unlock write-protected graphics when imported for editing in this way, and it did not give you the option to unlock them at the time. File protection status can be adjusted through a right-click menu within the Dreamweaver site view, but this doesn't really help once Fireworks is already running. Your only option is to return to Dreamweaver, unlock the file and start over. Again, we hope this 'feature' will be ironed out before the final release.

Legislation in many countries now means that you have to ensure your sites are accessible to the visually impaired, and it's in this area that Dreamweaver's new site reporting feature will come in handy. Select either an open document, your local site, a selection of files or the contents of a folder and it will hunt through for a variety of transgressions, such as missing Alt tags. Sadly, the list of omissions it will spot is not totally comprehensive, but it is a good start and certainly saves you time when it comes to fixing the essentials.

Some of the smaller tweaks are just as

useful. The new window-snapping feature now makes it easy to arrange palettes and working areas so that they do not overlap, instead snapping to each others' borders. It's still a bit of a screen guzzler, though. Macromedia recommends a minimum 800 x 600 resolution display, but this is unrealistic. 1,024 x 768 should be considered a bare minimum, with 1,158 x 864 feeling more comfortable.

There are a couple of rough

edges that will no doubt be ironed out before Dreamweaver 4 hits the shops at the end of the year, but the added usability features, closer integration with Fireworks, Flash button and text generation and table management make it a must-have product for the serious online designer. Although hand coders are not Dreamweaver's target audience, the improved code-writing features and split code/design view should certainly tickle the tastebuds of your diehard roll-your-own developers.

NIK RAWLINSON

DETAILS

★★★★★

PRICE Full product £269.08 (£229 ex VAT), upgrade from Dreamweaver 3 £116.33 (£99 ex VAT), Dreamweaver 4 Fireworks 4 Studio £410.08 (£349 ex VAT), Studio upgrade from Dreamweaver 3 Fireworks 3 Studio £175.08 (£149 ex VAT)

CONTACT Upgrades Unlimited
020 8358 5855, www.macromedia.com

SYSTEM REQUIREMENTS 120MHz or faster processor, Windows 9x/NT4 or later, 64MB of RAM, 110MB of available hard drive space, 256-colour monitor capable of 800 x 600 resolution (16-bit monitor 1,024 x 768 recommended), CD-ROM drive

PROS Extensive installed base; table layout features; improved coding environment; integrated O'Reilly's reference works

CONS Site reports could be enhanced; opportunity to unlock graphics while transferring to Fireworks would be appreciated

OVERALL Still the best web authoring tool available today

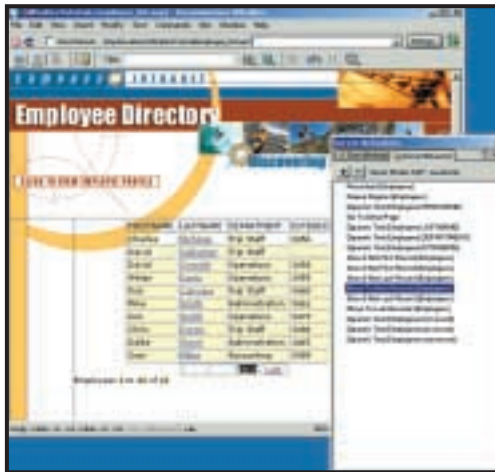
Dreamweaver UltraDev 4

If you want to create dynamic websites, take a look at this extension to Dreamweaver

UltraDev is an extended version of Dreamweaver that adds the ability to create dynamic websites, typically by connecting to a database. Three types of web application are supported, Microsoft's Active Server Pages (ASPs), Sun's JavaServer Pages (JSP), and Allaire's ColdFusion. Each of these technologies requires different code, but the key to UltraDev's capabilities lies in a feature called Server Behaviors. These are, effectively, wizards that generate code for web pages. UltraDev has three different sets of Server Behaviors, and which set you see depends on the type of web application you're creating. The application model is set when a site is defined, and although each model has a similar set of behaviours, they are not identical.

The emphasis in UltraDev is on rapid development and ease of use, making it particularly suitable for web designers looking for a quick route to include dynamic data. UltraDev's Server Behaviors inspector lets you define record sets and link HTML text or tables to database fields through drag-and-drop. The most frequently used functionality is provided for, so you can quickly show data in a grid, with next and previous buttons, search options, detail pages, use of session variables and information in HTTP requests. A new and welcome feature in this version is the ability to create secure sites, using a login page with access restricted to authenticated users. From a designer's perspective, one of UltraDev's strongest features is the ability to display live data, so you can see exactly how the page will look at runtime.

UltraDev is built on top of Dreamweaver, so Dreamweaver's new features are also available here. In addition, there are new capabilities specific to UltraDev. Remote database connectivity lets you use a database connection on the web server at design time. This is particularly useful on a Macintosh, where it can be difficult to set up a design-time connection to the database. UltraDev's code view is good for developers, with syntax highlighting and a drop-down list of functions for quick navigation, although it still falls short of a programmer's editor. You can now easily open non-visual files such as global.asa, used in an ASP application. The new Server Behavior Builder lets you



A strong feature of UltraDev is its ability to display live data at design time

create or edit behaviours through a dialog. You can base a new behaviour on an existing one, which is a great way to modify the generated code, creating a re-usable resource.

In this version of UltraDev, JSP developers get a better deal than those using ASP. In some cases the JSP behaviours have richer functionality. There's also a JavaBean behaviour that makes it easy to generate code that uses a JavaBean component. This is a server-side component running in JSP – not to be confused with a Java applet. When working with JavaBeans you can set default values to bean properties or bind them to HTML elements. This is true component-based development, which has many advantages over applications that depend on large amounts of embedded script. Oddly, Macromedia has not provided a similar feature for server-side COM objects running under ASP. Incidentally, Macromedia's own site uses JSP. UltraDev does not support the increasingly popular PHP, which is a shame for those using dial-up ISPs, as PHP support is easier and cheaper to find than the other application servers. You could create your own behaviours to support PHP or any other model, or find a set of third-party extensions.

This is a more complete product than UltraDev 1.0, although it still doesn't provide the one-stop ecommerce solution that the late Drumbeat once offered. Having said that, UltraDev has the great advantage of extensibility, using standard JavaScript and XML, and a trip to the Macromedia Exchange provides a

list of several hundred extensions, most of which are free to download and use with some also offering ecommerce features.

Page design and application development are different skills, rarely found in the same person. Dreamweaver is a designer's product, and while UltraDev adds application development features, it is not an alternative to development tools such as Visual InterDev for ASP or Borland JBuilder for JSP. One problem is that code generation is rarely an ideal development solution. If you modify the code by hand, you can't then go back to the wizard

that generated it. This age-old dilemma can be largely solved by using components, which is why the ability to exploit JavaBeans is important. This way, developers can create components using full-featured development tools, making it much easier for designers to incorporate the results.

This is not an issue for all UltraDev users. If the functionality you need is covered by the built-in functionality, assembling applications is easy. It's only when a more complex solution is required that UltraDev begins to falter.

TIM ANDERSON

DETAILS

★★★★★

PRICE Dreamweaver UltraDev £468.82 (£399 ex VAT), upgrade from UltraDev 1 £233.83 (£199 ex VAT), UltraDev/Fireworks 4 studio £586.33 (£499 ex VAT)

CONTACT Upgrades Unlimited
020 8358 5855, www.macromedia.com

SYSTEM REQUIREMENTS In addition to Dreamweaver's requirements, a web server running ASP (Microsoft or Chili!Soft), JSP (including IBM WebSphere, Allaire JRun, or Apache Tomcat), or Allaire's ColdFusion 4.0

PROS RAD web application development, great for designers

CONS Lacks integrated support for COM components; limitations of code-generation model

OVERALL The ideal product for creating simple dynamic websites, but not suitable for high-end web application development, particularly when using Active Server Pages

Macromedia Fireworks 4

A compelling upgrade that makes a big contribution to an all-in-one web development suite

Fireworks and Dreamweaver (see reviews on the previous pages) go so well together it's hardly surprising Macromedia sells them as an optional 'studio' package – one big box with both products inside. Dreamweaver can, of course, be customised to associate file types with non-Macromedia products, but these two understand each other so well that to run them together almost feels like you're using one integrated package. If you're a version 3 Dreamweaver and Fireworks user then you'll already have a taste of what this means, but this latest release, revision 4, takes it to new levels.

Like Dreamweaver and Flash, Fireworks is shipping with a standard set of customisable keyboard shortcuts and, of course, employs Macromedia's new unified user interface. For a while we felt a little lost without the button bar that runs across the top of Fireworks 3's screen, but as many of these buttons were used for opening and closing palettes we soon found we could cope without it, switching our attention instead to the launcher bar on the bottom of each window. It's also here that you'll find the new controls for

playing animations, which makes far more sense than siting them at the bottom of the application status bar, where they used to be. We were glad, also, to see that the 'Open Multiple' command has disappeared from the File menu, and that more than one file at a time can now be opened from the standard 'Open' command. A neat feature here is the ability to tell Fireworks to open the files as an animation. They will each be piled on top of one another ready for customising or simply to be saved out as an animated gif.

Although Fireworks 3 could import Photoshop files you can now also export psd documents and Illustrator files, although sadly, only to version 7 as far as the latter is concerned. Photoshop import has been improved to recognise masks, which Fireworks 3 would always destroy. Once imported, masks are linked to the Photoshop layer and can be edited if you find they don't quite work in your chosen layout.

That's the small fry, though. Fireworks 4 incorporates a number of impressive time-saving features. Reliance on the behaviours panel has been eased. This was once the way you'd generate

disconnected rollovers, so that when a visitor ran a mouse over a graphic on your site a description would pop up elsewhere. Until now, Adobe's ImageReady could claim to have the easiest way of generating this

complex effect using slices and a dialog box, but Fireworks has stolen the throne through the introduction of drag-and-drop rollovers.

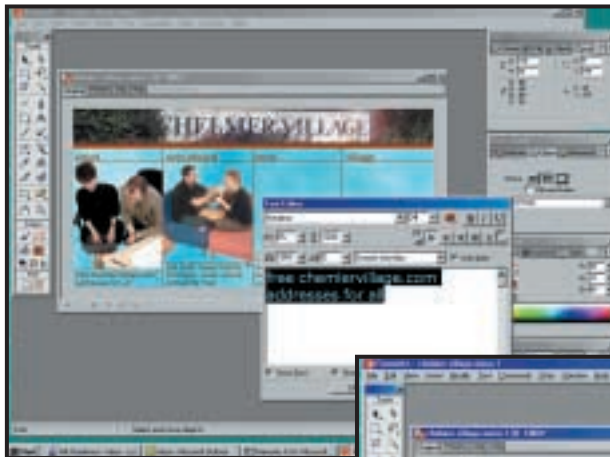
Once you've generated your rollover hotspots and set up a layer for each rollover result, simply drag a pointer from the hotspot to the result layer in exactly the same way you would define a page hotspot in Dreamweaver. A drop-down menu will then appear for you to select the appropriate result and your job is done – a genuine four or five-minute job.

Fireworks' new animation tool will be a genuine attraction for anyone creating ad banners, and cuts down on the amount of frame-by-frame animation needed. Once you've created the object you want to animate, selecting 'Animate Selection' from the Modify menu opens up a new dialog. Here, you enter the number of frames across which you want it to animate as well as details, such as the direction, whether it should rotate and any changes in opacity. Fireworks will calculate the intermediate images, add new frames if necessary, and draw a timeline showing the location on the page where each frame will be seen. This can be dragged to be made longer or shorter, and if you find it's too jerky, you can go back and tell it to calculate extra intermediate frames.

We were disappointed that, although we could move the path of motion around the screen, we could not define motion paths to be any more interesting than a straight line. Trying to move an intermediate frame simply drags the entire line. Also, it would be helpful to have the object fade in and out several

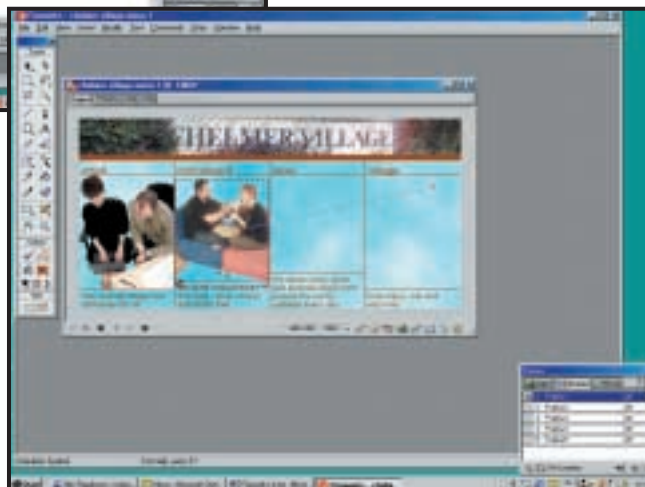
times, but in this initial revision Fireworks only allows for a one-way transition from light to dark and vice versa. This will not put dedicated applets out of business, or even Fireworks' frame pallet, come to that, but it's a genuine timesaver for the most basic animation tasks.

Macromedia has finally persuaded the text entry palette to play nicely with the rest of the package. When you typed text in version 3,



Above: Live text allows you to move your words around even while you're typing

Right: We created this five-frame animation in 30 seconds. The blue spots indicate each frame and the eastbound movement of the picture on the left





Selective jpeg compression. We have selected the two people on the chair so that lower compression settings can be applied here than on the rest of the image

process of defining entries and then selecting how your menu should look. How it's rendered is up to you – either in HTML or as an

image. We were disappointed that although the common font groupings are available you can't specify a relative font size such as 3 or -1, but are instead forced to opt for a CSS-style point size. Although, from a coding point of view, it makes sense to format them this way, it would have been better to have had the option and then relied on Fireworks to do the conversion in the background.

New additions include support for wbmp format for use on mobile devices. This is a much-welcomed feature since the Nokia WAP authoring extensions for Dreamweaver have been available for free download for some time now. The Batch Processing environment has been greatly improved, with a new interface that lets you add tasks to a list and remove them if you later change your mind. As you skip through the list the variables palette beneath dynamically updates. Unfortunately, though, it suffers the same problem as the 'Batch Process' function of Dreamweaver 3, namely that when you attempt to tweak the image optimisation settings there's no image preview. Some would argue that this is an unnecessary requirement, as showing just one image when several are being worked upon would be a pointless exercise, but being able to see how your alterations affect at least, say, the first image in your list would give less experienced users a helping hand.

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Sadly the love-it-or-hate-it browser-based help system of previous versions is still very much alive and kicking – it has never been a popular feature in the PCW office. While it's visually appealing, will be easy to update to encompass late-breaking developments, and is guaranteed to run glitch-free on any platform, it's slow in comparison to the more common Windows alternatives.

As far as many users were concerned, Fireworks 3 provided pretty much everything you could need, but version 4, with its selective jpeg compression, Dreamweaver-friendly table editing (see Dreamweaver review) and 'quick optimize' functions for compressing images within Dreamweaver without loading the whole application, make this a compelling upgrade. It will work quite happily as a standalone product for those already committed to developing websites using GoLive or an alternative platform, but it looks as though Macromedia has finally succeeded in creating the ultimate all-in-one web development suite.

NIK RAWLINSON

DETAILS

★★★★★

PRICE Full product £269.08 (£229 ex VAT), upgrade from Fireworks 3 £116.33 (£99 ex VAT), Dreamweaver 4 Fireworks 4 Studio £410.08 (£349 ex VAT), Studio upgrade from Dreamweaver 3 Fireworks 3 Studio £175.08 (£149 ex VAT)

CONTACT Upgrades Unlimited
020 8358 5855, www.macromedia.com

SYSTEM REQUIREMENTS Pentium II recommended, Windows 9x or NT4 SP3, 64MB of RAM, 256 colour display capable of 800 x 600 (16-bit at 1,024 x 768 recommended), CD-ROM drive

PROS Pop-up menu creation; complex rollover creation made easy

CONS Browser-based help system; still no preview in batch processing

OVERALL There should be enough new features here to tempt upgrades out of the Fireworks 3 user base

Adobe GoLive 5.0

Beginners may struggle, but experienced developers will find the program yields excellent results

There are two main website design suites for the serious developer market,

Dreamweaver from Macromedia and Adobe's GoLive. While the Macromedia products have the major part of the market, it's by no means set in stone, yet, that they will hold it. GoLive aims to cover most of the bases in website design, from laying out the pages, to modelling the entire site and linking pages to back-room databases and other data sources.

It can be seen as a 'grown up' version of PageMill, with extra facilities for ecommerce and dynamic websites.

Adobe has deliberately made the GoLive interface similar, where possible, to those of Photoshop and Illustrator and this is fine if you know these programs. For many, though, the multiplicity of separate palettes and dialogs makes the program less than intuitive.

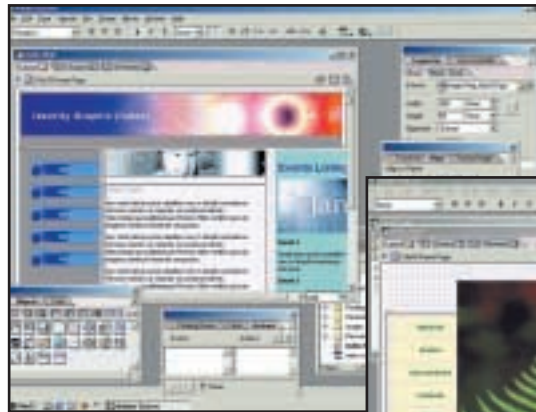
In GoLive, this problem is exacerbated by the many different views of the page that it offers. While they all have their uses, it can be confusing to pick your way through layout, frame, source code, outline and preview views. Once you understand what they're for, though, it gives unparalleled flexibility for designer and developer alike.

In layout view, construction of individual pages is simply a case of dragging and dropping pre-designed items and adding text, rules and simple graphics using the built-in drawing tools. This is much like a regular DTP program, such as PageMaker, and anybody used to working with page layout software will find it straightforward.

Frame view lets you design and adjust independent frames on a page and outline view shows the hierarchy of objects on a page. The source code view shows the HTML code behind your page and can be edited directly to place the final tweaks in the script.

Finally, 'preview' saves you having to flip between GoLive and a web browser to view the results of your work. You can keep several of these view windows open at once to see how your design is going.

Compatibility is one of the major requirements for a web authoring tool in a market still to find accepted standards for animation and scripting. GoLive 5.0 is happy with HTML, of course, and you can shift HTML scripts in and out of the



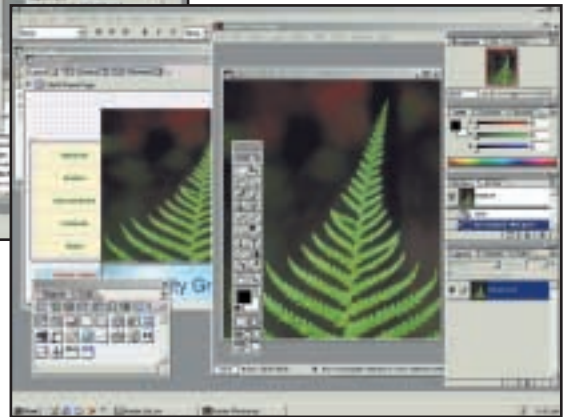
application for editing in separate HTML editors. It's also compliant with Java in both Sun's JavaScript and Microsoft JScript formats and handles Scalable Vector Graphics (SVG) and Cascading Style Sheets (CSS), two new and useful technologies.

Rival formats jostle for position in animation and video playback. GoLive can incorporate Macromedia Flash, Apple QuickTime and Real G2 formats by simply dragging and dropping objects onto a web page. Basic editing of streaming media is available, using a simple timeline to place objects in relation to each other. These media formats don't have the same level of integration as those from other Adobe applications, though.

If you're incorporating images from Photoshop or Illustrator, or animations from LiveMotion, you can choose to 'Edit Original' and move directly to the appropriate application to touch up an object. You'll need a fairly powerful PC (more than the recommended minimum of a Pentium 200) to move in this way but, given that, this interoperability should increase productivity. The integration of Adobe products in GoLive goes much further than the interlinking of Macromedia's Flash and FreeHand, which is restricted to file exchange.

GoLive 5.0 is designed both for site developers, who lay down the overall map of a site, and designers, who may create the look of the site on a page-by-page basis, or lay down a template, on to which information is overlaid. This second approach is a good way of giving a site a consistent feel – just as layout grids tie together pages in a paper document.

What first appears to be a mass of different windows and controls becomes clearer when you start laying out your website in earnest



Double-clicking on an imported image Smart-Linked from Photoshop calls up the app for editing. Any changes made are reflected in the web-safe version held in GoLive 5.0

This dual-use approach does make the program a bit of an uphill struggle if you're coming to it as a beginner. It's much more a tool for the experienced amateur or semi-professional site developer. As a complete beginner, you'd be better off with PageMill. For those who need the extra facilities, though, you'll find it a comprehensive program that can handle most tasks necessary to construct a professional website.

SIMON WILLIAMS

DETAILS

★★★★★

PRICE £234 (£199 ex VAT)

CONTACT Adobe 020 8606 4001

www.abode.com

SYSTEM REQUIREMENTS Pentium 200, 48MB of RAM (64MB for NT4 or 2000), Windows 98/Me/NT4/2000, 60MB of hard disk space, CD-ROM drive

PROS Close integration with Photoshop, Illustrator and LiveMotion. Internal previews – no browser needed. Application extensibility through JavaScript

CONS Can be daunting to a newcomer

OVERALL GoLive 5.0 is a businesslike web site design tool for the experienced developer. New facilities for streaming media and the tight integration with other Adobe design tools make it easy to build a complete web design system on a single machine

Jasc Paint Shop Pro 7

This bargain image-manipulation program is only let down by some poor web optimisation tools

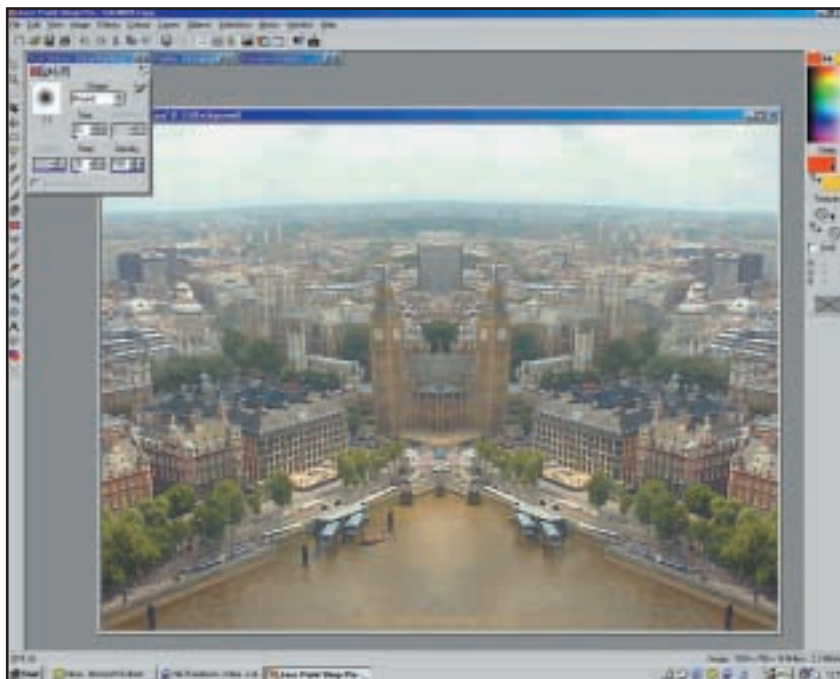
For some years now, Paint Shop Pro has been considered the poor person's Photoshop. Its extensive range of tools is hardly rivalled at the lower end of the image-manipulation market, making it a popular choice among many home web and print designers. For the first time it's also available in a UK English version.

Although there are more than enough tools for creating your own images within Paint Shop, particularly through the use of the vector tools and new gradients and textures that can be applied to fills and strokes, much of the package is geared more toward editing pre-created bitmap images, and particularly those captured using scanners and digital cameras. Version 7 introduces automatic colour balancing along similar lines to that found in Photoshop, but with the addition of presets for sunlight, fluorescent lighting and a variety of lighting sources between 2,500K and 9,300K.

Perhaps the most useful new feature is the red-eye removal tool, which covers up unsightly red pupils and replaces the discoloured cornea with one you select from a dropdown range. This not only covers human eyes, it also includes colours for dogs and cats. It even maintains the reflected light source, leaving some life in the picture. There's a scratch removal tool that impressed us when Jasc showed a demo of it, but when we put it to use in our own images its most noticeable effect seemed to be a general smudging of the surrounding area. We did manage to wipe some buildings off the London horizon with it, and take some supports out of a couple of bridges, but it was less impressive than we had hoped.

Photoshop users will welcome the new histogram adjustment function that works just like the one in Adobe's professional product and had been a notable omission from earlier Paint Shop releases. Sadly, though, the solar flare (or as Jasc calls it 'sunburst') is going to fool nobody. Looking more like the second coming than sunlight caught in a camera lens, it lacks any ring of truth. Unfortunately, many other effects are just as disappointing, and we couldn't help wondering if the reason some of them were there was to create impressive marketing stats.

Heavy users will welcome productivity



enhancements such as the simple arrangement of multiple images on a single page, saving costs when using expensive photo paper. There's also a batch-processing command for converting mixed format images to a single file type – useful if you're converting whole directories for use on a website.

We were very disappointed with the woefully inadequate web optimisation tools that serve their purpose but are a long way off being user friendly. Image slicing takes place in a dialog box rather than the standard interface, so you don't get to see the whole image you are working on unless it is very small. Two solutions are offered – either pan the image, which doesn't solve it so much as move it to another part of the image, or zoom out, which does little to help you achieve an accurate result. There is also no way of easily seeing with which parts of the image you have associated a URL, such as the alternate colouring methods of Fireworks. The rollover creator relies on you having already generated the alternative images for your mouse-states and then hunting around your drive for them. Many comparative packages allow you to generate the alternate states on either associated layers or frames.

Animation Shop 3 is bundled for quickly creating Internet-friendly animations, and we liked the way you can save your Paint Shop desktop so that the next time you come back to it all your

open images and palettes will be in place. Version 7 sees many new tools that Jasc is no doubt hoping will eat away further at the lower end of Adobe's market. To this end, it now even opens and saves Photoshop files with all layers intact. When you get down to seriously comparing the products head to head, though, Photoshop comes out top once again. Take the price into consideration, though, and Jasc still earns itself a four-star rating. Its hugely unfriendly web tools deny it five stars, but at this price you're still getting a great bit of software for which you could quite reasonably expect to pay far more.

NIK RAWLINSON

DETAILS

★★★★★

PRICE £93.94 (£79.95 ex VAT)

CONTACT Digital Workshop 01295 258 335

www.digitalworkshop.co.uk

SYSTEM REQUIREMENTS Pentium or equivalent processor (500MHz recommended), Windows 9x/Me/2000/NT4, 32MB of RAM (128MB recommended), 75MB of available hard drive space, CD-ROM drive, 256-colour display at 800 x 600 resolution or higher (32bit at 1,024 x 768 recommended)

PROS Price; red-eye tool

CONS Web optimisation tools

OVERALL You get what you'd expect for the price, and then some

BETA

CorelDraw 10

You still get plenty of applications for your money and it's a definite step up from version 9

It's been a tough year for Corel, which has seen its share price steadily sink, layoffs of large numbers of staff and the departure of founder and CEO Michael Cowpland. CorelDraw 9 was the tenth anniversary and Millennium release of the product – a tough act to follow.

The CorelDraw Graphics suite, legendary for the number of applications in the box, still gives you plenty for your money. In addition to the three core applications – CorelDraw, PhotoPaint and the new Corel Animator – supporting utilities include Microsoft Visual Basic for Applications 6.2, CorelTrace 10, Corel Capture 10, Canto Cumulus Desktop LE 5.0 and Bitstream Font Navigator 4.0

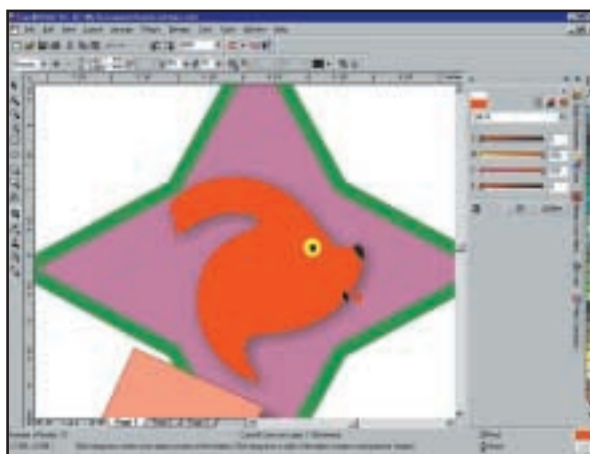
The main thrust of the upgrade centres on usability, colour management, preflighting and printing. Colour management has undergone a major revamp with all the essential options brought together in a single dialog box. There are three predefined colour management 'styles' for desktop printing, professional printing and the web, you can embed ICC profiles in image files and 'profile linking' allows you to link ICC profiles to individual printers.

The interface contains no big surprises, rather the kind of tweaks and touches that make what was previously a pain in the neck more of a pleasurable experience. New colour sliders have been added to the colour docker window, and these work with all colour models including the web-safe palette. You can also drag swatches from within the colour docker directly on to objects to apply a fill or stroke.

The property bar has been enhanced to provide more options for customising tools and defining object attributes. Some tools now offer a selection of presets from a pull-down menu and you can add and remove your own custom presets to this. The new 'Perfect Shapes' tool is a good example of the property bar's enhanced functions. The 'perfect shape' flyout offers five options – basic, arrow, flowchart, star and callout shapes. Having selected one of these, say, basic shapes, the property bar offers a further selection of shapes – a heart,

smiley face, teardrop and so on. The beta doesn't contain what you'd call a comprehensive selection, but no doubt the finished product will contain more and Corel is promising additional shape libraries to download from its website.

Perfect shapes are customisable to a limited degree. They have a 'glyph' button that is dragged to change the shape of part, or all of the object. With the smiley face it's the shape of the mouth, with the arrows it's the width of



The enhanced colour docker provides sliders for all colour models and drag and drop colouring

the shaft and head shape. Star glyphs control the depth of the points.

Perfect shapes aren't as perfect as all that, though. Once you've created one, you can't change its type, only its attributes – an arrow is always an arrow and can't be changed into a heart. The glyph adjuster provides very limited shape customisation. For example, when you apply a fill to the page curl shape, both the front and back of the page are filled with the same colour. To fill the back with a different colour you first have to convert the object to curves, break the curves apart, close the open section of the path, then fill the two objects, by which time you no longer have a perfect shape, just two filled objects.

Interactive tools are now easier to use and in many cases offer more direct control. Like most of the other interactive tools, the drop shadow tool offers a pull-down menu of presets. For some inexplicable reason this doesn't include a bottom right, but this is so easy to create it's no big deal. Once again, the property bar provides all the necessary adjusters, or you can Ctrl & click on the

drop shadow, which then displays position handles. Using these controls you can create any kind of perspective or flat drop shadow in seconds. The operation is entirely visual and a realtime preview means you can immediately assess the effects of your changes.

Many of CorelDraw 10's improvements will bring a smile to the face of old hands, while going unnoticed by everyone else. The 'select all' command is now context sensitive, selecting all of the same type as the currently selected object. So you can select all the guides, all the text, or all the nodes on a path. In addition to nudge and super nudge, there's now micronudge and the page sorter makes navigation of multi-page documents simpler. Photopaint 9's navigator window is a welcome addition, letting you pan around the page without having to zoom out and then back in again, likewise the undo docker provides a quick route back through your mistakes as well as source for VB macros.

A more customisable interface, improved pre-flight and export options, in-rip trapping and better object management all make this an upgrade for the professional user. But, aside from a nod in the direction of the web, with an image optimiser and tools for JavaScript rollover creation, there's little in the way of knockout features. So, more consolidation than innovation from Corel this time around.

KEN MCMAHON

DETAILS

★★★★★

PRICE £481.83 (£410.07 ex VAT)

CONTACT Corel 0800 581 028

www.corel.com

SYSTEM REQUIREMENTS Windows 98/2000/NT4, Pentium 200, 64MB of RAM (128MB recommended)

PROS Much improved interface and object management

CONS Little in the way of new features; shape tools lack versatility

OVERALL One for frustrated Draw 9 users looking for a more productive, easier work environment, but this isn't going to draw in Illustrator or Freehand fans

Microsoft Money 2001

It's the added extras that make this industry standard package a winner

Money and Quicken dominate the UK's personal financial software market, and with Money 2001, Microsoft launches three versions of its top-selling package – 'Standard', 'Personal and Business', and 'Financial Suite', reviewed here.

As with previous versions, Money 2001 centres on the Home screen, a central point of reference that gives a snapshot view of your financial status at any one time. Like Encarta's Home screen, you can set this to connect to the Internet and update each time you start the package. Money 2001 will also connect to your bank's website and download your statements, and the bank's homepage will even be added to the customised dropdown menus running across the top of the screen.

The Money team has really gone to town with customisation this year. The first stage in setting up the software is to tell it what you will be using it for by arranging a list of financial objectives in order of importance. It will then refocus the package on these areas. The setup procedure also leads you through detailing your bank and credit accounts, and their opening balances. It is at this point that Microsoft's work in localising its products comes to the fore, as the dropdown lists at your disposal include the names of 10 UK banks, to which you can add any other you might use.

Some areas might be a little tricky – when setting up your bills, for example, water and sewerage are assumed to come from a single supplier when many of us pay separate firms for the two.

Internet Explorer is an integral part of the suite, and you can access any site directly from the Home screen. There are plenty of links to MSN's MoneyCentral website, so this really is a package that benefits from some form of always-on connection. You shouldn't find yourself connecting unexpectedly, though – hover over any such link and the mouse pointer spawns an MSN logo.

The 'Planning for the Future' section includes tables for generating home inventories that can, optionally, be included in the calculation of your net worth. The will writing module refers to this, too, feeding everything into a dropdown list from which you can select when assigning the division of your belongings between your loved ones after your death. The will it generates is legal



You can create a cash flow forecast, link to your bank, print cheques and even write a will

in England and Wales and can be printed for signing or exported to a word processor in rtf format.

Important dates can be set to trigger reminders so you don't forget to pay bills or miss renewals in rolling insurance policies. Money Express will also install into the system tray and pop up with financial reminders when you next start Windows.

The key to financial security is careful planning, and it is here that Money 2001 Financial Suite excels. Rather encouragingly, the default life expectancy is 90 years so if you're approaching retirement you have 30 years on the golf course ahead of you. Whatever your age or employment status, once you have entered your salary and other details, Money presents you with a sliding scale showing what remains of your life. Move the pointer back and forth to see your net worth, what you'll probably be earning, what your likely debts will be and how interest and inflation affects your assets.

Combine this with the debt reduction planner and you're well on your way to financial security. This tells you what things really cost when you buy them on a credit card, and we were surprised at the results. Use this reviewer's card to buy something for £100 and pay it off in two £50 instalments, and at the interest rate charged you'll actually end up spending £115.25. On a brighter note, doing that rather than paying just the statement minimum saves over £180 in further interest charges.

There are a number of welcome tweaks that turn Money 2001 Financial Suite from

a good package into a great one. Cheque printing is an activity that was once restricted to bank or business use, but now Money has direct links to suppliers that will produce slips guaranteed to be accepted by your bank, with all of your account details in place ready for use in your printer. Managing your Frequent Flyer Airmiles is something else you would not expect a personal finance package to cover, but this one does, and it's bonus features like this that make all the difference to an excellent package.

NIK RAWLINSON

DETAILS

★★★★★



PRICE Microsoft Money 2001

Standard £29.99 (£25.52 ex VAT),

Financial Suite £49.99 (£42.54 ex VAT)

Personal and Business £69.99 (£59.57 ex VAT)

CONTACT Microsoft 0345 002000

www.microsoft.com

SYSTEM REQUIREMENTS 90MHz

Pentium or better, Windows 9x, 2000/NT4 running SP5, 24MB of RAM for Windows 9x (32MB RAM for NT and 2000), 75-210MB of hard disk space (210MB if Internet Explorer 5.01 or later is not already installed), IE 5.5 or later, two-speed CD-ROM drive, VGA graphics capabilities with a minimum of 256 colours, mouse, 14.4K modem for Internet banking, sound card

PROS Covers everything financial you could imagine – and then some; good net integration

CONS Insists you run Internet Explorer 5.5

OVERALL Financial planning at a price that won't stretch your finances

Picture It! 2001

Microsoft's document designer is easy to use and has a massive clipart library – but no A4 yet

Picture It! (or Photo & Print Studio British Version 2001 to give it its full title) is Microsoft's latest take on a photo touch-up and document designer for everyone. It's intended as a rival to Adobe's PhotoDeluxe and Corel's Photo and Print House and is aimed squarely at those who want to create cards, posters, brochures, even websites, with the minimum of fuss.

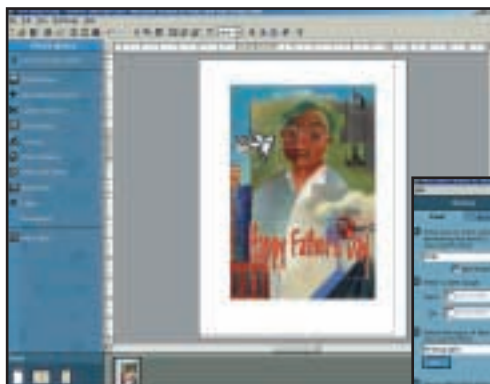
The package sports the kind of digital photo tools and filters that make it easy to remove red-eye, feather the edges of an image or distort your granny's face for humorous effect. It's styled more like Encarta or an educational website than a traditional office application and the interface is geared up to be as friendly as possible.

However, before you get to the program, you have to face the installation. This is not the simple process it often is with Microsoft applications. For a start, how much space would you think Picture It! would take on your hard drive? Bear in mind that PhotoDraw asks for 100MB and Publisher 2000 around 174MB. Maybe 150MB for Picture It!, then? The default installation of Picture It! takes 985MB.

Even a minimum installation takes 630MB, and you can't put it all on a drive other than C:. If you select to install on D: or E:, 499MB of free space is still demanded on your C: drive. As you would expect, all this data takes some time to copy – the set-up routine warns of waits of up to 80 minutes, though in practice it only took us about 20. As a final *coup de grâce*, the set-up program re-installed Internet Explorer 5.5 on a machine already running it, resetting options such as the home page.

This disk space is required to house the thumbnails of its massive gallery of clipart. Putting them on hard disk enables you to browse through them, but you still have to mount one of the five CDs to load the full-sized image.

The gallery is a key part of Picture It!. It contains over 150,000 images, as designer-drawn clipart and photos. There's a good range and several ways of searching them. It's easy to find at least one or two images on most subjects – some are perhaps over-represented. There are 59 pictures of rhinos, for example.



To help gather together the images you might want for a project, there's a useful tray at the bottom of the screen, into which you can drag and drop images, designs, borders – all kinds of graphical and textual elements. Many of the photo images can be used as bitmap objects, so you can combine them into collages. A further tool, the stack, which shows on the right-hand side of the editing window, helps order the objects. The front-most are at the top of the stack and those further back are nearer the bottom – simply drag and drop to alter the layering order.

You can add images of your own, of course, from scanner or digital camera, as well as create new categories in the gallery. It's possible to knock out a foreground object from its background, too, with an easy-to-use tool. As long as the background isn't too crowded, the software finds the edge of the object and draws a selection marquee itself.

There's a lot of help available, with videos, animated tutorials, demos and walkthroughs. From a blank sheet of paper or web page you can build all manner of documents with well-wrought special effects, such as PicturePutty (similar to Kai's SuperGoo), automated shadows, background blurring and fading through transparency.

When it comes to printing a document, you stumble across another idiosyncrasy of Picture It!. Although the product packaging and the CDs themselves brandish the phrase 'British version', there's currently no support for metric paper sizes in the product. When PCW pointed this out to Microsoft it said it was working on a patch. As our review copy stands, you can select US Letter or

Picture elements in Picture It! can be treated with special effects and combined to produce a collage. These assembled pictures can then form the basis of all kinds of documents, including web pages



Picture It! offers a huge range of clipart spread across five CDs – including a rather large herd of rhinos. As you browse through the thumbnails, the small numbers show which disc you'll need to load

US Legal paper, but no A4 or A5. With any luck a patch will appear on Microsoft's website before long.

The help system and the manual – which has its own problems with 'before' and 'after' shots (at least two show 'before' and 'before' images) – make no reference to paper size at all. If you have a lot of hard drive space and can use US paper sizes, Picture It! is easy to use and very versatile. It sadly misses the basics for an international product, though.

SIMON WILLIAMS

DETAILS

★★

PRICE £49.99 (€42.54 ex VAT)

CONTACT Microsoft 0345 002000

www.microsoft.com

SYSTEM REQUIREMENTS Pentium 166, 64MB of RAM, Windows 95/98/Me/NT4/2000, 985MB of hard disk space (minimum), CD-ROM drive

PROS Heavy hand-holding; well-implemented effects and filters; massive clipart library

CONS No metric paper size support; massive installation; flawed manual

OVERALL While PictureIt! Photo and Print Studio should be an ideal vehicle for creating a wide variety of photo and design-based documents, it's not without its problems. Chief among these must be its current lack of support for metric paper sizes

Mac OS X

Can Apple's OS X make the Mac more reliable and still easy to use? Currently the jury's out

Apple is betting a lot on OS X. Steve Jobs, the company's founder and CEO, recently stated that OS X 'is the future of the Mac', and he's right about that. The success or failure of OS X will pretty much determine the success or failure of Apple over the next few years.

Many still find the current Mac operating system easier to use than Windows, thanks to its more elegant user interface. However, beneath that interface, the Mac OS is old and dusty. It crashes too often and it lacks features such as protected memory, multitasking and support for multiprocessor hardware – basic requirements for any modern operating system.

Well, OS X – pronounced 'OS ten' – certainly has all those features, being based on a Unix variant known as BSD. The problem with Unix, though, is that it lacks the ease of use that has always been the Mac's strong point. So can Apple combine the Unix underpinnings

around the Finder – Apple's name for the desktop display that you see on screen when you start your Mac. The Finder displays your hard disk as an icon in the top right-hand corner of the screen and you 'find' all your applications and documents by clicking on that icon and browsing through the folders.

The Finder has now gone. The main desktop display of OS X is little more than blank space. But running along the bottom of the screen is a horizontal strip known as the 'Dock'. The right-hand side of the Dock stores documents that are currently in use, while the left-hand side stores applications. The idea is that instead of clicking on a series of folders to locate your applications and

documents, you put them in the Dock for easy access.

One application already in the Dock is called the Desktop. This is, in effect, the replacement for the Finder. Like the Explorer in Windows, it displays the contents of your computer, including all hard disks, removable storage items such as floppy disks, and network connections. You can then click on any of these items in order to view their contents. This comparison with the Windows

Explorer will scare many Mac users.

Our reaction to this new arrangement is certainly mixed. The Desktop does make it easier to navigate through the contents of your hard disk, especially if you've got layer upon layer of folders-within-folders. However, it isn't as instantly intuitive as the old Finder, and it may take some time to get used to.

The other problem for Mac users will be trying to use their existing software with OS X. The good news is that most current Mac programs should run quite well under OS X. This is achieved by running the current OS 9 operating system under a kind of emulation, so you're effectively running



New features include a redesigned set of Systems Preferences, and a built-in MP3 player



The Finder is dead. Long live the colourful new OS X Desktop

of OS X with a slick graphical user interface that will prove acceptable to existing Mac users? That's one of the reasons Apple has released this 'public beta'. The company wants to get user feedback ahead of the official launch, scheduled for early next year.

It has to be said that many Mac users probably won't like OS X when they first see it – not because it's bad, but simply because it's so different. Admittedly, it's gorgeous to look at, with colourful animated icons, slick anti-aliased text and semi-transparent windows. But the actual workings of the interface are very different from the current OS 9.

The existing Mac interface revolves

your OS 9 software in a 'virtual' Mac within OS X.

However, these OS 9 applications will still have the old OS 9 interface, and won't be able to exploit the new features of OS X, such as the protected memory that should make them less prone to crashing. If you want to get the full benefit of the new OS X architecture you'll have to wait for software developers to produce special OS X upgrades of their programs. And that, of course, is one of the big question marks hanging over OS X.

If developers produce OS X software quickly then the improved performance and reliability of this software will give Mac users a real incentive to make the switch. Ultimately, it's too early to make a definite judgement on this beta. It's promising, but still has many rough edges. We'll just have to wait and see what happens to those rough edges.

CLIFF JOSEPH

DETAILS

PRICE £24.99 (£21.27 ex VAT) for beta – final pricing TBA

CONTACT Apple 0800 783 4846
www.apple.com

SYSTEM REQUIREMENTS Macintosh with G3 or G4 processor

PROS Slick, colourful interface with Unix reliability

CONS This beta lacks the intuitive ease of use of the current Mac OS

OVERALL The Mac certainly needs the improved reliability of OS X, but it's still unclear whether Apple can maintain the Mac's legendary ease of use

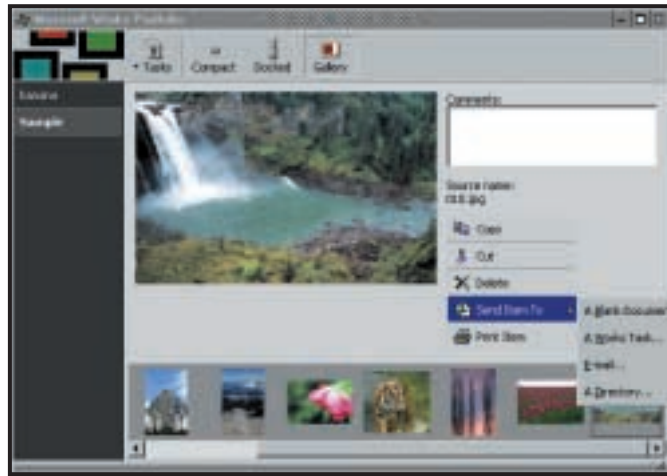
Works Suite 2001

This could well be the ideal package for those who hanker after Office 2000, but can't afford it

Every time a group test or review PC arrives with just Microsoft Works as the bundled productivity suite we say the same thing – 'if only it had been Works Suite'. Just in time for Christmas, Microsoft has launched the latest version of this mid-range collection of useful applications, in the form of Works Suite 2001.

For the average home user, the cost and scope of any flavour of Office 2000 is way too high, and while Word and Excel may be of use, PowerPoint and Access most likely will not. It's to these users that Works Suite should appeal, including the full industrial-strength Word 2000 and Money 2001 Standard Edition, as well as Encarta Interactive World Atlas 2001, Picture It! Publishing, AutoRoute 2001 and Works 6.

The core of the suite is Works 6, but it also insists, like many Microsoft applications, on installing Internet Explorer 5.5. Works 6 includes an address book, database, calendar and, perhaps best of all, a spreadsheet capable of reading and writing Excel files. It will only read basic one-page spreadsheets, but this makes Works Suite a viable office tool. Only those who need the full functionality of Office 2000



If you find something you like on the web, it's easy to drag and drop it into the Portfolio and from there send it anywhere you desire

eliminating paste actions, and letting you copy objects before deciding where you want them. To help organise things, Portfolio contents can be split into albums. Our only complaint was that once you have an item in one album you can't then drag it into another, so you're stuck with it wherever you first put it.

Works itself is a front end holding everything together, and it looks very much like a web page, which could account for its insistence that you install IE5.5. How you use it is up to you. Either take the task-based approach where you

and plan for the future. The Financial Suite edition reviewed on page 126 has far more in the way of investment management and added features that help you look towards retirement and write a will. The majority of users, though, would be unlikely to put these features to good use, so the Works-bundled version will probably suffice.

New in this release is comprehensive support for synchronising data with handheld PCs running Windows CE, and for mobile phones, and to facilitate this PhoneSync is rather irritatingly installed by default.

Works has had its fair share of bad press, largely due to manufacturers bundling it with £2,000 PCs. Sadly much of this has rubbed off on the very able Works Suite. Put your preconceptions aside, though. If you're a home user who wants but can't afford Office 2000 then give Works Suite 2001 a go instead.

NIK RAWLINSON

You think about what you want to do and then let Works decide the best approach

need run it, while the company can invest in Works Suite 2001 for all remaining employees at around a sixth of the cost.

The Address book interrogates your Outlook contacts and lets you send emails by selecting a name and clicking on send mail from the actions menu. This can also be set as the default application for reading vCard data, which is often at the bottom of many emails.

It's now easier to organise your assets, with the Portfolio, which is like an intelligent clipboard and is one of those things that, once you've got used to it, you'll never be able to go back to the old way of working. If you find something in an email, or a graphic on a web page, or any other kind of content in a document you're viewing, you can drag and drop it straight into the Portfolio. From there a copy can be dragged into any other kind of document, saving you time by

think about what you want to do and then let Works decide which is the best approach to use for the job, or you can go straight to the relevant application, which you'll find in one of the menus.

The remaining products, Word aside, which is the full-blown product, are the lower-end versions of software already reviewed by PCW. Encarta Interactive World Atlas, as the name suggests, is part of the much larger encyclopedia. This is certainly a desirable product, and the fact that the entire text of the Encarta encyclopedia is now available online at <http://encarta.msn.com> means that if you're happy logging on every time you want to look something up this should satisfy many homework requirements.

Thanks to Money 2001 Standard it's easy to connect to your bank's online services and download your statements electronically, keep your finances in order

DETAILS

★★★★★



PRICE £119.99 (£102.12 ex VAT)

CONTACT Microsoft 0345 002 000

www.microsoft.com

SYSTEM REQUIREMENTS 166MHz or faster processor, 32MB of RAM (64MB recommended), 850MB of hard drive space, four-speed CD-ROM drive, 800 x 600 16bit display

PROS Full version of Word and more than adequate versions of Money, AutoRoute and Encarta Atlas

CONS Portfolio could be a little more flexible

OVERALL A very able office suite that will suit all but the most power-hungry user

PERSONAL COMPUTER WORLD

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ENTRY-LEVEL PC

Atlas
Meridian A800T ME



new

Based on the 800MHz Athlon, this PC has an Asus A7V motherboard, a 1GHz processor and has a 200MHz FSB augmented by 128MB of PC133 SDRAM. There is a 15.3GB IBM hard drive, as well as a Teac CD-RW drive and an eight-speed DVD-ROM drive for movie playback. It's also great for video-in-and-out functionality with a ProLink TV-tuner card.

Review November 2000, p192 **Price** £1,173.83 (£999 ex VAT)
Contact Atlas 07000 285 275 www.atlasplc.com

MID-RANGE PC

Panrix
Magnum 900



Built on the Asus A7V motherboard this PC has a 900MHz Athlon, 128MB of PC133 memory, a 40GB Maxtor DiamondMax Plus hard disk and a BURN-Proof CD-RW. Its DVD is a slot loading AOpen drive, while graphics are covered by a 32MB Radeon. With video piping out to the Mitsubishi Diamond Plus 91 19in monitor this is an excellent mid-range system with Windows ME.

Review December 2000, p75 **Price** £1,761.33 (£1,499 ex VAT)
Contact Panrix 0113 244 4958 www.panrix.com

HIGH-END PC

Systemax
P1000RV
Entertainment Edn



This is an excellent PC that includes a 1GHz Pentium III, 256MB of PC133 memory, a Pioneer DVD-105, Iomega Zip CD-RW, a Creative SoundBlaster Live! Platinum, a 30.7GB Maxtor DiamondMax hard disk, Cambridge Soundworks speakers, a Hauppauge Win-TV tuner card, an ATI Radeon, a CXTX PR960F monitor and more.

Review December 2000, p181 **Price** £2,231 (£1,899 ex VAT)
Contact Simply 0870 7297 366 www.simply.co.uk

FULLY-FEATURED NOTEBOOK

IBM
Thinkpad A20P



This well-built notebook exudes quality. The Thinkpad has a mobile Pentium III 700MHz, 128MB of RAM, 16MB ATI mobility M3 graphics, 18GB hard drive, DVD, floppy and all the ports you need except FireWire. IBM's Ultrabay 2000 allows you to swap the DVD for optional extras, and the 1,400 x 1,050 TFT is a shining example of a 15in screen.

Review November 2000, p93 **Price** £2,205.47 (£1,877 ex VAT)
Contact IBM 0870 010 2512 www.pc.ibm.com/buydirect

ULTRA-PORTABLE NOTEBOOK

Sony
Vaio PCG-Z600NE

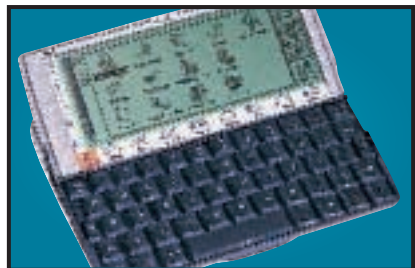


The Z600NE has taken everything that was good about the original and made it that little bit better. It is built around a 650MHz Pentium III SpeedStep processor, which drops the speed and voltage of the CPU in order to preserve battery power. With 128MB of RAM, a 12GB hard disk, IrDA, a modem and a FireWire socket, the Vaio is both versatile and ultra-portable.

Review October 2000, p79 **Price** £2,399 (£2,042 ex VAT)
Contact Sony 08705 424 424 www.sony.co.uk

PDA

Psion
5mx



The Psion 5mx is a quality PDA weighing 354g. It has a screen resolution of 640 x 240, a serial connector for syncing with your PC and space for upgrading with Flash memory. The keyboard is excellent and responsive, ideal for its word processing capabilities. With 16MB of memory and 15MB of Flash memory this is an ideal handheld computer.

Review December 2000, p220 **Price** £351.99 (£299.57 ex VAT)
Contact Psion 0990 143 050 www.pSION.com

PDA**Handspring
Visor Platinum****new**

A 33MHz Motorola Dragonball VZ processor makes the Platinum about 50 per cent faster than its predecessor. The battery meter now has a '3D' appearance and the address book functions have single tap duplications.

Review January 2001, p90 **Price** £249.10 (£12 ex VAT)
Contact Handspring 020 7309 0134 www.handspring.com/uk

WEBCAM**Creative
WebCam Go Plus**

With 8MB of memory and a built-in mic, the WebCam Go can also be used as a low-res handheld snapper or video camera. With excellent image quality and software you can snap up to 150 pictures in 32bit colour.

Review October 2000, p96 **Price** £109.27 (£93 ex VAT)
Contact dabs.com 0800 138 5240 www.europe.creative.com

SOUND CARD**Creative Labs
SB Live! Platinum 5.1****new**

The best consumer sound product just got better. Creative has added onboard 5.1 channel Dolby Digital processing and an infra-red remote control. It's got every connector you could ever ask for and is truly the card for sound enthusiasts.

Review January 2001, p102 **Price** £179 (£152.34 ex VAT)
Contact Creative www.europe.creative.com

COLOUR INKJET**Hewlett-Packard
DeskJet 930C**

This uses the same engine as the higher spec P1100 and is a breeze to setup. Connection is via the parallel or USB interface and drivers allow you to adjust the printed page drying time.

Review July 2000, p201 **Price** £149 (£126.81 ex VAT)
Contact HP 0990 47 47 47 www.europe.hp.com

BUDGET LASER PRINTER**Kyocera
FS-1000**

This printer is driven by a 75MHz PowerPC processor, comes with a standard 4MB of RAM and can print up to 1,200dpi. It also has an environmentally friendly re-usable toner drum.

Review October 2000, p110 **Price** £304.33 (£259 ex VAT)
Contact dabs.com 0800 138 5240 www.kyocera.co.uk

COLOUR PHOTO PRINTER**Epson
Stylus Photo 870**

Aimed at the professional imaging user, our test photo was beautifully rendered, there was no evidence of undesirable banding and skin tones were accurately reproduced.

Review July 2000, p206 **Price** £173.90 (£148 ex VAT)
Contact dabs.com 0800 138 5240 www.epson.co.uk

BUSINESS LASER PRINTER**Hewlett-Packard
LaserJet 4050TN**

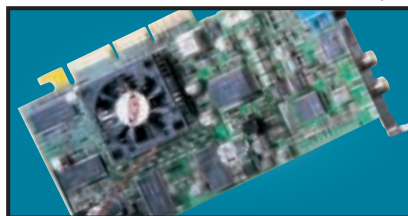
The 4050TN's 1,200dpi resolution is outstanding, and with a 133MHz NEC processor and 16MB of RAM it can turn out 16ppm. It also comes network-ready as standard.

Review September 1999, p96 **Price** £1,166.78 (£993 ex VAT)
Contact dabs.com 0800 138 5240 www.europe.hp.com

DIGITAL CAMERA**Sony
Cyber-shot DSC-P1****new**

Squeezing in a 3x optical zoom this compact boasts 3.3megapixels. With 15-60-second video capturing capability and a built-in speaker, there are some great features here.

Review January 2001, p202 **Price** £699 (£594.89 ex VAT)
Contact Sony 0990 111 999 www.sony.co.uk

GRAPHICS CARD**ATI
Radeon**

With an integrated Transform and Lighting engine, the Radeon also supports hardware environment bump mapping for lifelike surfaces and its 32bit performance is second to none.

Review October 2000, p199 **Price** £229 (£194.89 ex VAT)
Contact ATI 01628 477 788 www.ati.com

MOBILE PHONE**Nokia
6210****new**

Weighing 114g, this lightweight WAP phone has a larger memory than its predecessors and supports HSCSD. It uses Nokia's WAP 1.1 browser, which is the most intuitive around.

Review December 2000, p87 **Price** £129.99 (£110.63 ex VAT)
Contact Nokia 0990 003 110 www.nokia.com

EIDE HARD DRIVE**IBM
Deskstar 75GXP**

A 75GB drive with an areal density of 11GB/sq in. It has a spindle speed of 7,200rpm, a 2MB data buffer and an average seek time of 8.5ms. A lot of storage for the money.

Review September 2000, p109 **Price** £404.20 (£344 ex VAT)
Contact dabs.com 020 8523 4020 www.dabs.com

SCSI HARD DRIVE**Quantum
Atlas V**

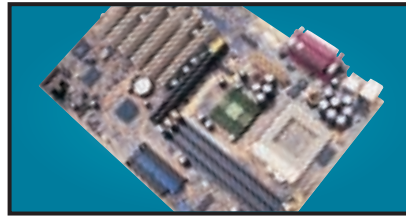
Increased areal density makes this 36GB drive impressive. It may not be as fast as 10,000rpm drives, but with seek times around 6.3ms and a spin rate of 7,200rpm, it's good value.

Review July 2000, p100 **Price** £528.75 (£450 ex VAT)
Contact Quantum 01344 353 500 www.quantum.com

SOCKET A MOTHERBOARD**Abit
K7T Raid**

This motherboard has a HighPoint HPT370 controller for onboard UltraDMA100 IDE RAID for anyone who needs a lot of disk space, a fan on the Northbridge of the chipset for overclocking and an ISA slot for any older cards.

Review December 2000, p100 **Price** £139.82 (€119 ex VAT)
Contact dabs.com 0800 138 5240 www.dabs.com

FC-PGA MOTHERBOARD**Asus
CUSL2**

A well laid out 815E motherboard that sports six PCI slots, two CNR slots and an AGP Pro slot. The documentation is first rate and the board is simple to set up. Quite expensive, but certainly worth the money.

Review November 2000, p219 **Price** £138.65 (€118 ex VAT)
Contact dabs.com 0800 138 5204 www.asus.com

PROJECTOR**Ask
M3**

This is 60 x 175 x 210 (h x w x d) and weighs in at 1.7Kg. It produces a very bright 1,000 ANSI lumen image, up to 230in diagonal that is easy to read even under fluorescent lights. With DVI and USB at the rear, it is versatile too.

Review December 2000, p107 **Price** £5,046.62 (€4,295 ex VAT)
Contact Ask-Proxima 01628 666 622 www.askproxima.com

17IN MONITOR**Iiyama
VisionMaster Pro 410**

This monitor has excellent image quality and vibrant colours. With resolutions on the Natural Flat aperture-grille tube up to 1,600 x 1,200 at 75Hz this unit is an ideal 17in solution.

Review September 2000, p192 **Price** £276.12 (€235 ex VAT)
Contact Iiyama 01438 314 417 www.iiyama.co.uk

19IN MONITOR**CTX
PR960F**

Equipped with an FD Trinitron tube this has a constant 0.24mm pitch across the screen. It also has an additional BNC input and a built-in USB hub as standard.

Review June 2000, p91 **Price** £374.83 (€319 ex VAT)
Contact dabs.com 0800 138 5240 www.dabs.com

21IN MONITOR**Sony
Multiscan G500**

The name Sony is synonymous with high-quality displays and this 21in FD Trinitron monitor is no exception. It has dual-input connectors and remains crisp even up to 1,800 x 1,440 at 75Hz.

Review May 2000, p226 **Price** £911 (€775 ex VAT)
Contact Sony 0990 424 424 www.sony-cp.com

LCD MONITOR**Synnex
18NE-TD**

This 18in display has a native resolution of 1,280 x 1,024 and it only has a DVI connector. When connected to an appropriate graphics card, this will ensure a perfectly sized picture.

Review November 2000, p121 **Price** £1,761.33 (€1,499 ex VAT)
Contact Synnex 01952 207 364 www.synnexuk.com

SPEAKERS**Creative
DTT3500
Digital Speakers**

This is the best audio solution we've seen. It's got its own Dolby Digital processor, great sound reproduction and all the cabling you need to get a home entertainment system up and running.

Review January 2001 p102 **Price** £249 (€211.91 ex VAT)
Contact Creative www.europe.creative.com

CD-RW**Plextor
PX-W1210TA**

This CD-RW uses Burn-Proof technology and has one of the fastest rewrite speeds around: 10-speed rewrite and 12-speed write, making using this loads of fun.

Review September 2000, p121 **Price** £210.33 (€179 ex VAT)
Contact dabs.com 0800 138 5240 www.plextor.com

REMOVABLE STORAGE**Panasonic
LF-D201 DVD-RAM**

With a disc capacity of 4.7GB per side, compatibility with existing 2.6GB and new 4.7GB per side discs, and a versatile software bundle, this is a great product for storing large amounts of data.

Review October 2000, p98 **Price** £351.33 (€299 ex VAT)
Contact dabs.com 0800 138 5240 www.panasonic.co.uk

BACKUP**OnStream
SC30**

The SC30 has a 30GB compressed data capacity and using Backup Exec it achieved over 70Mbytes/min. Echo software provides drive-letter access so you can treat it like a hard drive.

Review September 1999, p102 **Price** £370.13 (€315 ex VAT)
Contact dabs.com 0800 138 5240 www.onstream.com

DVD DRIVE**AOpen
DVD 1640 Pro**

An impressive 16-speed DVD reader that includes Cyberlink's Power DVD movie player. A first-class unit that marries excellent performance with solid build quality.

Review August 2000, p196 **Price** £118.68 (€101 ex VAT)
Contact dabs.com 0800 138 5240 www.aopen.nl



ILLUSTRATION EMMA GRIFFIN

Just browsing...

WITH A LITTLE JAVASCRIPT
PROGRAMMING KNOW-HOW, YOUR
WEB PAGES COULD BE TRANSFORMED,
EXPLAINS TIM ANDERSON



Animation, slide shows, opening new browser windows, cookie control, multimedia, form validation, and much more: JavaScript does it all. Here's a quick look at what JavaScript is and where it comes from.

JavaScript is a scripting language for web browsers. It was developed by Netscape for Navigator 2.0, and in the earlier beta versions was called LiveScript. In December 1995, Netscape and Sun announced JavaScript, which was LiveScript renamed to link it with the Java brand name.

Despite this, JavaScript is an entirely different animal from Java, Sun's platform-independent programming language. However, they are both cross-platform languages intended to look familiar to C programmers, so do have a little in common.

JavaScript has a couple of other names. Microsoft's version is called JScript, and there is a JavaScript standard approved by the European Computer Manufacturers' Association, under

the catchy name ECMAScript. Both Netscape and Microsoft have issued several versions, and as with other languages there are differences in both features and implementation.

By far the most common use of JavaScript is for client-side scripting in web pages. That means it runs on the user's machine, as opposed to CGI or Active Server Page scripts that run on the web server. Some web servers also support server-side JavaScript, and through the Windows Scripting Host you can also run it from the Windows desktop.

When you write JavaScript code, you need to know not only the language itself, but also what objects are presented by the browser. There are more differences between the Netscape and Internet Explorer object models than there are between the language implementations. If, like most people, you want to support both the most popular browsers and different versions of each, maintaining compatibility is a constant headache. There is no substitute for a good reference and lots of testing.

First steps in JavaScript



To get you started quickly, here is hello world in JavaScript. You can create this using Notepad or any editor able to save as plain text.

```
<html><head>
<title>Simple script</title>
<script language="java
script">
<!--
document.write("Hello from
PCW!")
// -->
</script>
</head>
<body>
<noscript>
<p>Sorry you don't have
script available</p>
```

```
</noscript></body></html>
(Key: ✓ code string continues)
```

Actually there is only one line of true JavaScript here. The rest is HTML to create a document, define the script, and hide the script from browsers that cannot run scripts, or more likely are configured not to. This is standard practice for JavaScript developers. It is done by wrapping the script in HTML comment delimiters:

```
<!-- this is a comment
//-->
```

When browsers hit a tag that they do not understand, they normally ignore the tag but still output the content. Making the content a comment suppresses this output.

Finally, browsers that have script enabled ignore content wrapped in a <noscript> tag. It is not quite perfect, since Navigator 2.0 and Internet Explorer 3.0 do support JavaScript, but do not understand about <noscript>. To accommodate this, you can specify: `<script language="JavaScript1.1">` at the cost of suppressing all script in these early browsers.

A pragmatic solution is to develop for Navigator 4.x and IE 4.x. Requiring customers to have version 4.0 or higher is not unreasonable, as these browsers have been available for a long time now, and give you the benefit of Dynamic HTML as well as script support.

How JavaScript runs

When a web browser encounters script within a page, it first executes any top-level code (in other words, code that is not within a function), reading the page from top to bottom. This includes allocating memory for global variables. Code within functions is executed if and when those functions are called. Finally, code in event handlers executes when those events fire, which could be as the page loads or in response to user actions such as clicking a button.

JavaScript basics

If you are familiar with other programming languages, you will pick up JavaScript quickly. Here are the key features.

Case sensitivity

JavaScript is case-sensitive, which comes as a shock to VB or Delphi developers. For example, MyVar is a different variable to myVar.

Statements and comments

JavaScript is normally written with one statement per line. You can put more than one statement on a line if you end each one with a semicolon.

Semicolons at the end of each line are optional – JavaScript will not object, but equally it is happy without them.

Single-line comments use a double slash (//) at the beginning of the line. Longer comments use:

```
/* comments here etc. */
as in C or C++.
```

Variables and data types

You cannot declare variables to be of a particular type in JavaScript, and you can assign any type to any variable. The type of a variable is determined by the value it contains. This can be a string, a number, a Boolean (true or false), an array or an object. In addition, two special data types are null and undefined. The `typeof()` operator returns the data type as a string.

Variables should be declared before they are used, with the `var` keyword, and you can assign a value at the same time:

```
var myvar = "myvalue"
```

You can also declare a variable simply by assigning it a value, but in this case what you get is a global variable. Otherwise, variables are local to the function in which they are defined. The

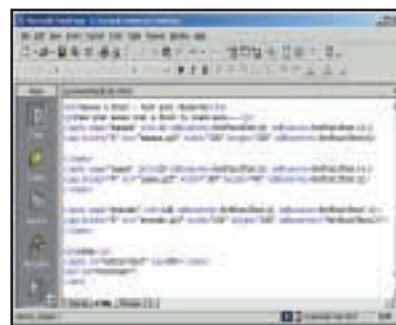
Activating dynamic text



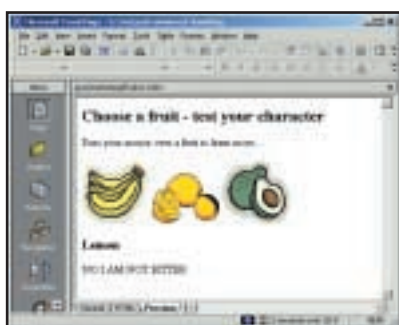
The aim of this project is to produce text that changes according to the position of the mouse. This is a great feature for a content-rich web page. The example shows three images. When the mouse is over a particular image, descriptive content appears below. This is done by handling the `onmouseover` event for each image, to call a JavaScript function that sets the text accordingly. Unfortunately, the `` tag in Navigator 4.x does not support `onmouseover`.



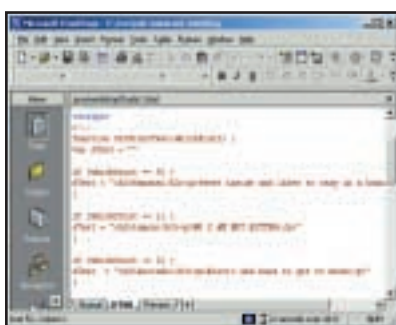
1 Layout the page with a heading and three images. Specify exact sizes for the images. Below this comes a placeholder for the text that JavaScript will control. For Internet Explorer, there are two obvious choices for this, the `<div>` and `` tags. Either of these can encompass an arbitrary amount of HTML, and can be scripted through the DHTML object model. If you want to support Navigator 4.x, the only choice is `<layer>`, which IE does not recognise.



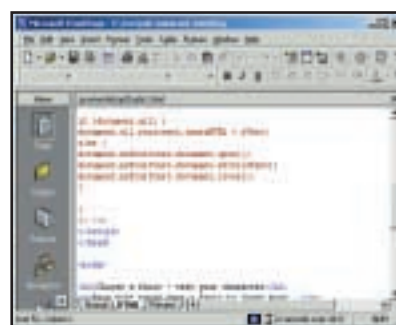
2 Here is a solution. Give Navigator a `<layer>` tag with an ID of 'nsfruittext', while IE gets a `<div>` with an ID of 'fruittext'. IE will ignore `<layer>`. Navigator will see the `<div>`, but since it has no content that does not matter. A further fall-back is `<nolayer>`, which versions of Navigator that support layers will ignore. The `<layer>` element should be positioned, since there will be other layers in this document and they should not overlap.



3 The `onmouseover` event will set the text, while `onmouseout` removes it. For IE, the event handler could be set for the `` tag, but to work in Navigator, we need either another `<layer>` or the `<a>` anchor tag. The anchor is ideal if each image is a hyperlink, but will not work otherwise. Otherwise, wrap each `` in a `<layer>`, setting the position and event handlers for both. Navigator will use those in `<layer>`, and IE those in ``.



4 The code for `SetFruitText` begins by setting the new text according to the current image, using the argument passed by the event handler. A value of -1 indicates that the text should be blanked out. Note that the new text can include HTML tags. In some situations, you might want to generate a large proportion of a page in client-side script.



5 The final part of `SetFruitText` writes the new text to the document. In IE, write: `document.all.fruittext.innerHTML = sText`
For Navigator, three lines are needed: `document.nsfruittext.open()`
`document.nsfruittext.write(sText)`
`document.nsfruittext.close()`

proper way to declare global variables is to do so outside any functions.

Arrays

Arrays in JavaScript are similar to objects. You declare an array using the `new` keyword, and access elements using `[]` notation.

For example:

```
var myarr = new Array()
myarr[0] = 1234
myarr[1] = 5678
```

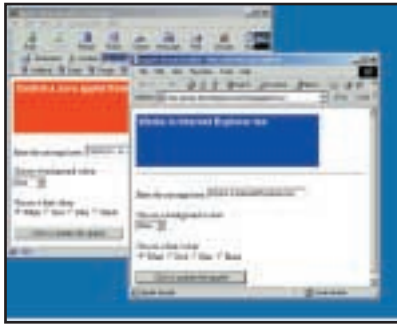
Operators

In JavaScript, `=` is used for assignment, but not comparison. To compare two values, use `==` (equal) or `!=` (not equal). The usual operators for greater or lesser comparisons also apply, for example `>=` (more than or equal). JavaScript also supports `&&` (logical AND), `||` (logical OR) and `!` (logical NOT), which only work with Boolean values. Bitwise operators exist, but are not covered here. Arithmetic operators include `%` (modulus), `++` (increment) and `--` (decrement).

QUICK TIP

Use a timer for special effects or animation. Call the `setTimeout` method of the window object like this: `setTimeout("myfunc()", 500)`
`myfunc()` is the name of the function to be called. The delay is in milliseconds.

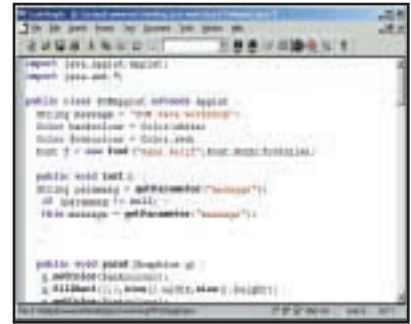
Controlling a Java applet – create the applet



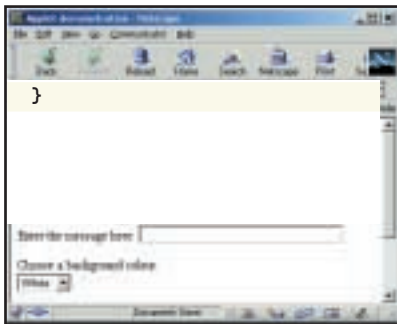
This workshop demonstrates several things. First, how to process a form on the client. Often this is done to validate data before sending it to the server, but in this case the data entered on the form is used to control a Java applet. Java is a powerful language, so the possibilities are extensive. Typical uses include charting, site navigation, grids, and front ends for ecommerce or online banking apps. The complete code for this example is at www.itwritings.com/pcw/workshop/.



1 To create the Java applet, you need nothing more than the Java SDK, available for download from java.sun.com, and a simple editor such as Notepad. This example is an AWT (Abstract Window Toolkit) applet, simply because browser support for Java is notoriously out of date. There are ways round this, using Sun's Java plug-in to run a later version of Java, but if you can manage with AWT then this keeps things simple for users.

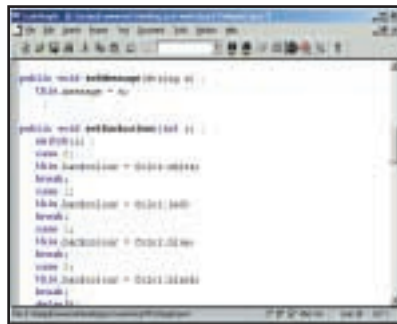


2 The applet displays a message against a coloured background. The PCWApplet class declares variables for background colour, font, font colour and message. The paint method draws the applet using these variables. The applet reads the initial message from a parameter passed to it in the HTML <applet> tag. It also has public methods that let you set these variables programmatically. A refresh method causes the applet to repaint using the new values.



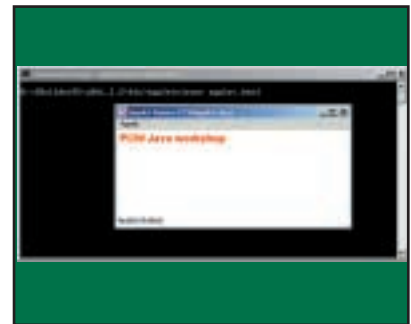
3 The init() method for the applet gets called when the applet is loaded by the browser. It uses the getParameter function to read the parameter called 'message':

```
public void init() {
    String parammsg =
    getParameter("message");
    if (parammsg != null) {
        this.message =
        getParameter("message");
    }
}
```



4 Here is the Java code that changes the message. Because it is a public method, JavaScript will be able to call it. Note the use of the "this" keyword by which the applet class refers to its own member variables.

```
public void
setMessage(String s) {
    this.message = s;
}
```



5 To compile the applet, open up a command window and type:

```
javac PCWApplet.java
```

The Java compiler is in the bin directory of the Java SDK, and you may need to specify the full path. All being well, you will have a new file called PCWApplet.class. This applet is simple, so this .class file is all you need. Simply copy it to the same directory as the web page that will use it.

QUICK TIP

If you use 'this' as an argument in an event handler, the current object passes a reference to itself. It saves drilling down to find the right form or control.

There are some subtleties concerning JavaScript versions, type coercion and strict equality. For example, the string 5 and the number 5 are equal in some circumstances but not others. Best practice is to convert variables to the same type before doing the comparison, using the Number() and String() functions.

Control statements

Conditional statements in JavaScript look like this:

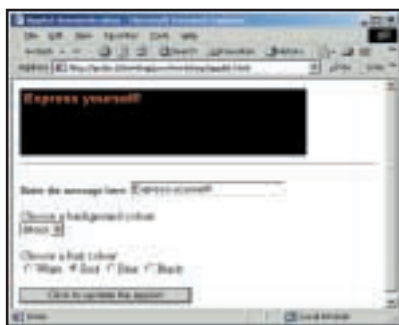
```
if (condition) {
    statements }
else {
    other statements }
```

The curly brackets are not essential if each block is a single statement, but are strongly recommended for clarity.

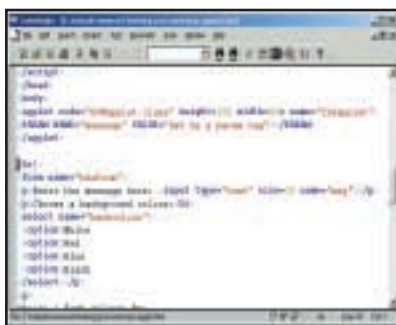
Here is a JavaScript loop:

```
for (var i = 0; i < 10; i++) {
    document.write("Loop the loop: ") }
```

Controlling a Java applet – the JavaScript side

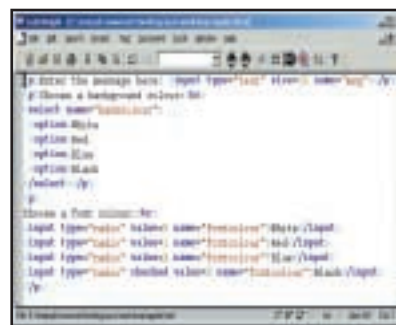


The starting point for the web page that will contain and control the applet is a form, where the user can enter a message and select the required colours. It uses an input field, a select control, and a radio button (for variety). Each control has a name property that will be used by JavaScript to identify its value, as does the form itself. Finally, there is a button with an onClick() handler set to a JavaScript function.

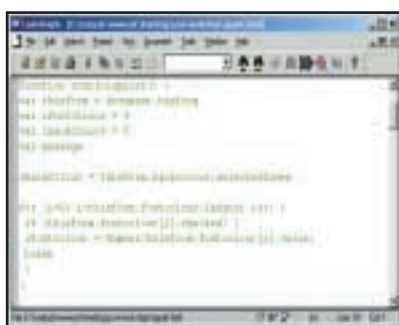


1 The Java applet code includes a call to `getParameter` in order to read initial settings specified within the `<applet>` tag. This is the corresponding HTML code:

```
<applet code="PCWApplet .class" height=100 width=80% name="theapplet">
<PARAM NAME="message" VALUE="Set by a param" tag"></PARAM>
</applet>
```

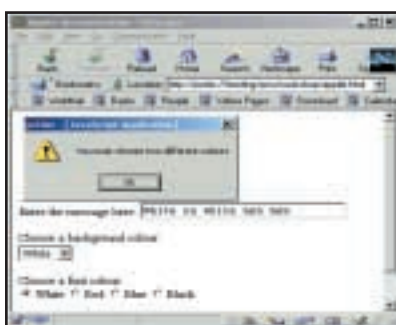


2 It is important to include attributes to allow JavaScript to read the data. A `<select>` menu object can be read either by inspecting its `selectedIndex` property, or by reading its `options[]` array, or by a combination of both. For example, to get the text of the current selection you can write: `selectobject.options[selectobject.selectedIndex].text`. In this workshop we take a shortcut by simply using the `selectedIndex` property.



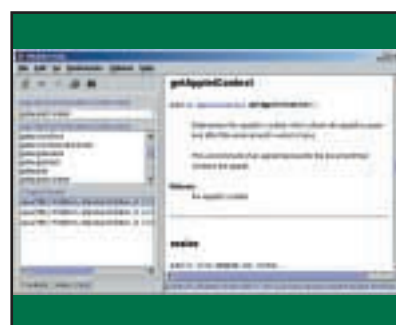
3 A radio button object does not have a `selectedIndex` property – you need to iterate through the buttons inspecting the checked property of each one until you hit the target. The `length` property tells you how many buttons there are, with the index starting at zero.

```
if (thisform.fontcolour [i].checked) {
iFontColour = Number(thisform.fontcolour[i].value)
```



4 You can exit a JavaScript function with the `return` statement. This also returns a value to the code that called it. Here, the user is unlikely to be happy if the font and background colours are the same, so:

```
if (iBackColour == iFontColour) {
alert("You must choose two different colours")
return
}
```



5 Calling the Java applet is simplicity itself – treat it like any other object:

```
document.theapplet.setMessage(message)
document.theapplet.setBackgroundColor(iBackColour)
document.theapplet.setFontColour(iFontColour)
document.theapplet.refresh()
```

It is possible for applets to control the browser, through the `getAppletContext` method.

```
" + String(i) + "<br>")
}
```

You can use `break` to break out of a loop. JavaScript also supports `while` statements. In version 1.2 or above, you can also use `switch` statements and `do ... while`.

Functions and objects

The `function` keyword declares a new function. The syntax is like this:

```
function functionname(argument
```

```
list){
... statements
...return expression
}
```

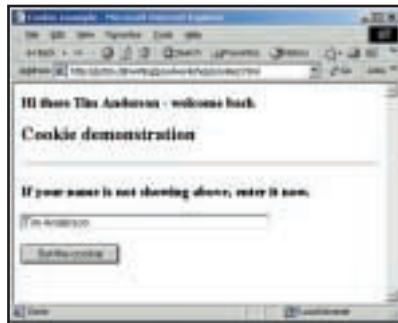
Numbers and Boolean values are passed by value, while objects, arrays and functions are passed by reference. Strings are passed by reference, but compared by value.

JavaScript is not fully object-oriented, but does let you control and create objects. There are intrinsic objects: `Array`, `String`, `Math`, `Date` and

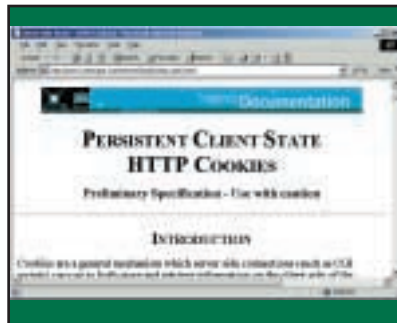
QUICK TIP

Check compatibility by redirecting to your real script's page using a short script in the `<head>` section. Use `navigator.userAgent` to detect versions.

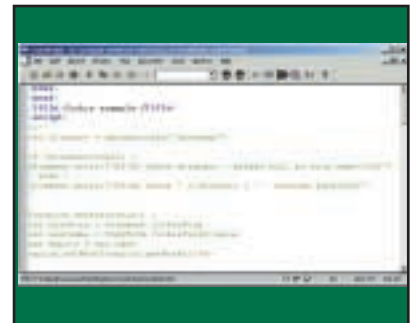
Using a cookie



Cookies make your website more personal and more professional. No longer do your users have to start from scratch whenever they visit your site. You can have a degree of personalisation ranging from greeting the user by name, as in this example, to setting up an entirely customised home page, as done by some portal sites. The great thing about cookies is that they are automatic – the user does not need to enter a name and password.

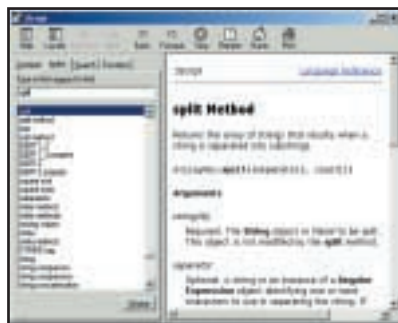


1 In essence, controlling cookies from JavaScript is simple. Each cookie contains data of the form name=value, along with entries for path=, domain=, expires=, and secure. The document.cookie property is a string containing all the cookies available to the document. If you set document.cookie to a new value, then it either adds to the cookies, or replaces a cookie of the same name. Cookies are separated by semicolons.



2 Write to document.cookie property. For persistence, set an expiry value.

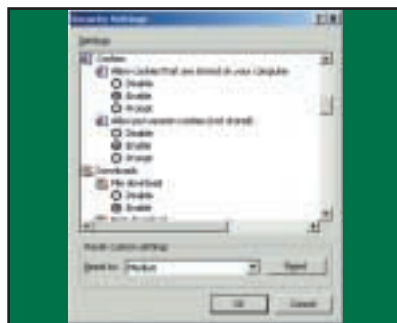
```
var thisform = document.
cookieform
var username = thisform.
cookiefield.value
var expiry = new Date
expiry.setMonth (6)
document.cookie="username2=
"+username+";expires="+
expiry.toGMTString()
```



3 The obvious solution for retrieving cookies is to have a getCookie function that takes a name argument and returns the value part of the cookie, if it exists. JavaScript's split method is a handy function for this. Split reads a string and returns an array, splitting the string at each occurrence of a specified delimiter. Therefore:

```
cookiearray=document.cookie.
split("; ")
```

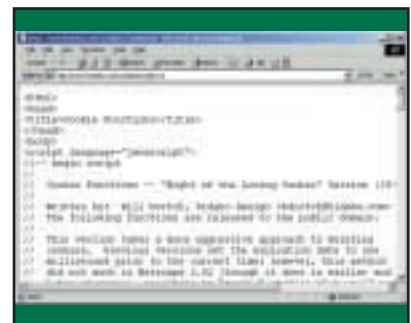
makes each cookie an element in an array.



4 A complete getCookie function can then split each element of the array at the = sign to give name and value pairs, eg:

```
var onecookie = cookie
array[i].split("=");
if (cookiename ==
onecookie[0])
return (onecookie[1]);
}
```

Note that the user can disable cookies.



5 If you work extensively with cookies, there are some subtleties to deal with. One is special characters, for which you can use the escape and unescape functions. You might also want to delete existing cookies. One answer is to use a library of cookie functions – check out www.hidaho.com/cookies/cookie.txt. Dealing with cookies from server applications is different – consult the documentation for the server-side technology you are using.

QUICK TIP

To validate a form, include a submit button and set an onSubmit handler:

```
<form onSubmit
= "return myfunc
(this)">
```

If the function returns true, the form is submitted, but if false, it is not.

Number. In addition, much JavaScript code manipulates objects exposed by its host, typically the web browser.

Finally, you can create custom objects like this:

```
function magazine(name,issue) {
this.name = name
this.issue = issue
}
var mymag = new magazine("PCW",
"February 2001")
```

```
alert (mymag.name)
```

Note the use of 'this' meaning 'the current object'. JavaScript custom objects are not very powerful compared to those in Java or C++, but they do support properties and methods, and through prototypes you can have inherited properties and shared methods.

Special characters

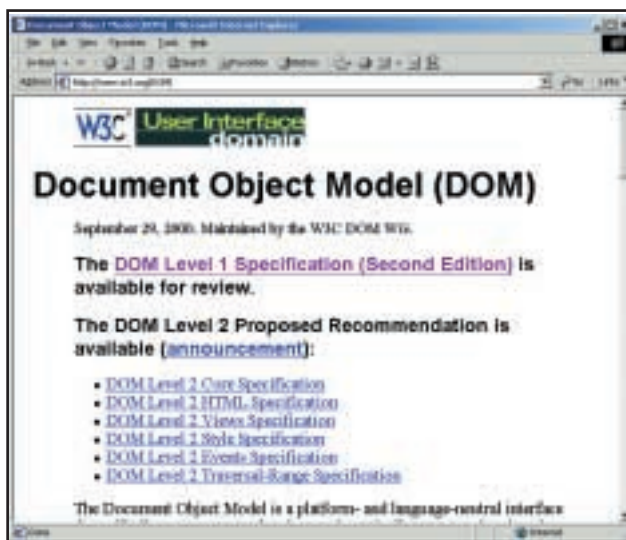
To insert special characters such as carriage returns or tabs into a JavaScript string, use the

About the Document Object Model

To use JavaScript to its full extent, you need to learn about the Document Object Model (DOM), as well as JavaScript itself. DOM exposes the contents of a web page for programming, so that you can use script to move, replace or otherwise manipulate what the user sees or hears. DOM objects also support events, such as `onmouseover` or `onclick`, enabling highly interactive pages. This is the difference between HTML and Dynamic HTML (DHTML).

DHTML is supported by Microsoft Internet Explorer 4.0 and higher, and Netscape Navigator 4.0 and higher.

On the whole, IE's DHTML support is richer and more complete, but Navigator has a tag called `<layer>` that enables many sophisticated effects. It appears that the `<layer>` tag is a dead end, and it may not even be supported in Navigator 6.0. Unfortunately, the reality is that there are plenty of users with Navigator 4.x, bearing in mind that IE is not even available for many platforms, such as Linux for example.



The W3C has approved a standard DOM, but Netscape and Microsoft are dragging their heels in implementing it

If you want to support IE and Navigator, you'll have to learn about `<layer>` as well as IE's DHTML.

When you program to DOM, you use dot notation. Objects you want to control must have a name or ID attribute, and then you can drill down to the object in code.

For example, `document.entryform.namefield` might refer to an `<input>` control

called `namefield` in a form called `entryform`.

DOM also supports collections – so, for instance, you can iterate through all the images on a page.

The W3C (World Wide Web Consortium) has approved a standard DOM, but the main browser vendors are being slow to implement it fully. Currently, IE comes closest, but Navigator 6.0 may well overtake it.

backslash as an escape character. For example, `\n` is a new line, `\r` is a carriage return, `\t` a tab, and `\"` a double quotation mark.

When to use JavaScript

Most web users allow scripts to run, but some do not, either through choice, or company policy, or because they have an old browser, or are using a small device such as a PDA. What that means is that to get the broadest possible reach, do not use any client-side script, or at least provide alternative pages for non-script browsers.

The other side of the coin is that most web designers find they need some degree of client-side scripting to get the best results.

Here are some typical uses.

- An e-commerce site that lets you see a product description in a pop-up window.
- A search page that sets the focus to a particular edit control when you arrive.
- A site that redirects according to which browser you are using.
- Websites that let you launch a multimedia player.
- Pages with mouseover effects such as glowing buttons or dynamic help text.

- Forms that have client-side validation, so that the whole page does not have to be redisplayed when there is a problem with the entered data.

Some features – from form validation to displaying today's date at the top of the page – can be done with either client-side or server-side scripting. Server-side is easier for the developer, since it runs in a known environment. Client-side gives better performance and the ability to control single objects on the page, unlike server-side scripts that can only send complete pages.

Resources

All examples from this workshop, with full scripts, are at: www.itwriting.com/pcw/workshop/.

There are plenty of online resources for JavaScript, including <http://developer.netscape.com> and www.msdn.microsoft.com/scripting.

A great beginner's book is *JavaScript for the World Wide Web* by Tom Negrino and Dori Smith (Peachpit Press, ISBN 0201 354632), which costs £13.99.

For advanced detail, see *JavaScript, the Definitive Guide* (O'Reilly, ISBN 156 5923928) £26.50.



The sound of silence



EARLIER THIS YEAR, NAPSTER TOOK ON THE MIGHT OF ROCK BAND METALLICA AND THE MUSIC INDUSTRY – AND LOST. GUY MATTHEWS LOOKS AT THE IMPLICATIONS

THEY CREATED A MONSTER, said US District Judge Marilyn Hall Patel of Napster's founders back in July, when she came seriously close to closing down the MP3 music distributor. In the event, she granted it a precarious stay of execution pending the appeals process.

That process is still ongoing, but regardless of its result, history will judge that Napster has tilted the world of mass entertainment a little on its axis. The case has also helped to redefine the meaning of intellectual property in the digital age.

When Shaun Fanning, an 18-year-old US computer nerd and music freak, made headlines with his music website last year, neither he nor anybody else initially realised quite what a fuss would ensue.

Napster's novelty was that it enabled music fans worldwide to swap and share music by their favourite bands, using the MP3 file format. Tens of thousands of people at a time were able to use Napster to open their hard drives to each other and freely trade music files, most of which were copyrighted.

The site has become immensely popular – a little over a year from its launch, Napster's 20 million users have, perhaps, a million tracks to choose from. In months it has gone from an enthusiast's plaything to one of the most visited sites on the web.

ILLUSTRATION Eddie Bowen



The significance of the legal furor surrounding Napster, and others, this summer goes well beyond the market for recorded music. It is not too much of a cliché to conclude that it is the first pitched battle in a war that will determine how entertainment in all its forms is created and delivered to us in the future.

The companies that control media such as books, movies, TV, radio and computer games are all waking up to the fact that the level of control they once exerted may be lost to them for ever.

The smart money says that Napster will not survive and will pay a ghastly price for being at the cutting edge of this media revolution. But those with a sense of historical destiny – as opposed to those who merely relish a juicy headline – are looking beyond the immediate fate of Napster, and wondering what is going to happen next.

That is by no means certain, even within Napster's own realm of recorded music. It looks unlikely, though, that downloadable music is going away. Even if Napster is successfully shackled, there's no shortage of other players ready to jump into the void. Many of them are forearmed with tactics that will make them almost impossible to beat in the courtroom.

Gnutella is one such, and is designed from the outset to be lawyer proof. It has no central server, does not charge users anything and guarantees anonymity. The aim is to create self-perpetuating networks of users, with no identifiable hosts for the authorities to locate.

The point about Gnutella, and similar sites such as SonicNet.com, AudioFind.com and Toadnode.com is that they are, in the main, unprofitable and aggressively anti-establishment. If the music industry thought it could win the MP3 war by taking on the well-marshalled forces of Napster on the legal battlefield, then it will soon realise that the real foe is an army of highly motivated guerrillas who recognise no such authority.

Underlying this summer's legal goings-on has been a major issue much on the minds of both Napster and its foes: is it possible for the Napster/MP3 model to come to some sort of accord with the established recorded



18-year-old Shaun Fanning, whose website could force drastic changes to copyright laws

music industry, so that both share in the bounty that this important and, frankly, inevitable new distribution channel represents?

If not – and that seems the most likely outcome at this point – then a number of possibilities emerge. If the MP3 brigade can find a legally untouchable way of going about their business, then they can stick two fingers up at Sony, Universal and their ilk.

The music industry would then continue to try to fight fire with fire, using downloadable

music formats of its own, a strategy it has already experimented with. But record companies could never compete with Napster, let alone the likes of Gnutella, and continue to support their own high overheads – overheads that CD buyers have been bankrolling until now.

The only solution presently acceptable to the music industry is total defeat and eradication of the entire MP3 community. Then, in its place, it would run its ersatz alternative, one that it controls totally.

A statement this summer from lawyer Hilary Rosen, acting for establishment rottweiler the Recording Industry Association of America (RIAA), sums it up: 'What we ultimately wish to come out of this process is an increased co-operation between innovation and industry, so legitimate business models can make more music available online.' Rosen's definition of a 'legitimate business model' can be taken as read not to include anything like Napster.

Against this prevailing and antagonistic mood, Napster and its opponents have spent the summer talking, looking for possibilities for settlement and peaceful co-existence. But the talks haven't borne fruit.

Napster chief executive Hank Barry says he and his lawyers have offered several financial and business proposals to the individual labels. The company has been working on business models that involve a subscription service, whereby Napster users might pay a monthly fee for access to the service. Even if this fee was as low as \$5 (approx £3) a month, Napster could potentially pass on around \$500m to record companies in 2001, estimates Barry.

A polite but cold hearing is all that Barry says he has received. No counter-proposal has been forthcoming, he claims. The record companies, he believes, are not simply after a financial settlement. What is at stake in their eyes is control of the industry, which they have owned in totality for decades, and see no reason to share.

SonicNet.com is a more aggressively anti-establishment version of Napster



This, it has to be remembered, is an industry adept at controlling upstart rebellion. If it could manage Elvis Presley's hip swinging, the Beatles' LSD-tinged counter-culture and Johnny Rotten's Destroy T-shirt, then it understandably finds it hard to bow down to what it sees as common thieves plundering its property for their own gain or, worse, fun.

The record labels have not even wanted it to appear that they are involved in a process of negotiation, maintaining in public the simple line that Napster must be quashed since it is 'a business built on piracy'.

The truth goes a little deeper. Napster's summer of litigation amounts to more than a squabble over a tricky point of law. It has turned into a test case both for the online music business model, in its various forms, and the future of copyright law on the Internet. The music industry has, unwittingly, become a standard bearer for the bricks-and-mortar world as it battles the onset of the digital age.

Napster's arguments not only hold the potential to reshape widely held assumptions about copyright law, they also have a bearing on many other aspects of technical progress, which explains why the case has excited so much attention from so many quarters.

Napster's case has been bolstered by a number of voices with which it seems to share little direct interest. Technology industry groups, such as the Consumer Electronics Association, have filed their own briefs in the

ongoing appeal. While they don't explicitly support Napster, they do express concern that an anti-Napster ruling could endanger technological progress across a wide front.

One such issue is the use of file-swapping software, as pioneered by Napster, for use in fields such as medical research. The US equivalent of the British Medical Association has said Judge Patel's decision threatened 'the dissemination of important therapeutic medical information'.

A spokesman for the Computer Electronics Association (CEA), whose members include Compaq, Intel and, ironically, Sony, has commented: 'Our primary concern is about the First Amendment in the digital age, and the ability of content providers to shut down new technologies.'

Similar noises have also been made by the Digital Media Association, which acts for Lycos, Yahoo and Amazon, among others.

Some voices appear to be damning Napster while giving a cautious welcome to the new world it seems to herald. Gregory Ahorianan, a US lawyer and an



Napster allows its 20 million users to open their hard drives to each other and freely trade music files



MP3.com – where it all went wrong

Attempted appeasement of one's enemies, especially in the heat of battle, is seldom a good policy. This bitter lesson was learned by MP3.com, the free download site, as it tried to come to terms with the forces ranged against it this summer by the music industry.

MP3.com and its free-download My.MP3.com site, self-described variously as a 'virtual CD library' and 'virtual Walkman', hit trouble in May when the Recording Industry Association of America (RIAA) won a copyright infringement case against it.

Faced with what it anticipated would be vast damages, not to mention probable destruction at the



hands of record companies using the ruling as a blunt instrument, MP3.com started to talk about licensing tracks from the world's major record labels to put itself on the right side of the law. It also offered to pull any tracks from its service that the companies wanted.

However, the attempted mollification had no effect. The so-called big five record companies – Sony, EMI, BMG, Warner, and Universal Music – had all scented blood. The first four of these came to an out-of-court

arrangement with MP3.com to the tune of a reported \$20m each – in Sony's case only weeks before the damages hearing was due to begin.

Only Universal pressed on for its day in court and pound of flesh, chasing a hoped for \$450m to 'deter others'. This outlandish sum was based on a figure of \$45,000 for each of 10,000 CDs that Universal reckoned MP3.com had illegally copied. MP3.com, with its settlement war chest of \$150m, awaited events with trepidation.

In the event, on 6 September, US District Judge Jed Rakoff ruled against MP3.com, finding that the organisation had 'wilfully

violated' the copyrights of record companies with its service.

Judge Rakoff ordered the company to pay Universal \$25,000 per CD, totalling roughly \$118m. The judge said it was necessary to make an example of MP3.com, to inhibit further copyright infringement via the web, pretty much singing Universal's tune, if not gratifying it all the way.

Roughly half of the CDs in MP3.com's collection are estimated not to be covered by either the out-of-court deals or the Rakoff ruling, so this result could launch a second wave of lawsuits against MP3.com.

It has vowed, not unsurprisingly, to appeal.



FOR NAPSTER

Indie band Radiohead
and Madonna



acknowledged expert in the field of intellectual property, copyright and patents, said: 'On one side is the music and entertainment industry arguing for strict adherence to the copyright laws. The other side argues that some copyright theft is fine if these programs can be used to take down the greedy and arrogant large music and entertainment companies.' After all, it's not just the fat profits of Sony and their ilk but the wages of their artists that are under threat.

Ahoronian's own prediction is that Napster will ultimately lose when, as he said, 'the courts realise that Napster is pretty much lying through its teeth when it says it can't afford in real time to catch much of the exchange of copyright materials, and therefore concludes that Napster is more of a tool to promote theft than one to help people occasionally fairly share purchased goods. Napster is trying to be both part of the establishment and to be anti-establishment, an untenable position.'

Rather in the manner of a world war, Napster's case has ended up involving parties that started neutral. Among the interesting sideshows the Napster case has thrown up is the opportunistic response of advertisers.

Advertising spending at online music sites jumped dramatically during the summer. Before

the first anti-Napster ruling, advertisers were spending a modest \$2m on music sites. In the week after, the figure jumped to over \$5m, market researchers reported.

The phenomenon occurred as people flocked to music sites to fill their hard drives with free music before the curtain came down – a kind of musical panic-buying. This trend might seem fairly minor in itself, but it does say something about the commercial potential and ultimate legitimacy of online music.

It is also linked to the debate about whether MP3 actually encourages CD buying through conventional channels, rather than slows it. Some market research reports seem to show that MP3 users buy more music than consumers who don't use the service. No less an authority than market researchers Gartner surveyed 40,000 US households in February of this year, revealing that MP3 users were purchasing three more CDs on average in a six-month period than non-MP3 users. They are also the type of buyer more inclined to purchase CDs on the web, making them highly representative of the key music buyers of tomorrow.

They may largely be using music sites to evaluate new music. This hands Napster, and indeed its more illicit co-defendants, the

Napster's case: a legal rollercoaster

Napster's initial defence against litigation from the US recording industry was that it was protected by US laws which say ISPs are not legally accountable for the law-breaking activities of individual users of their service. But this avenue proved a blind alley as heavy-metal band Metallica and rapper Dr Dre forced the company to ban more than half a million of their fans who had downloaded tracks using Napster.

Napster then narrowly avoided closure, winning an eleventh-hour stay of execution in July, allowing it to continue trading for the duration of the legal proceedings.

The appeal kicked off on 2 October, heard by a three-strong panel of judges in San Francisco.

Napster's main contention has always been that it is simply providing a service for users to share music, regardless of whether or not the music is copyrighted.

One of the cornerstones of this tack is the so-called Sony Betamax defence. Napster's legal team has argued that its technology deserves the same protection the Supreme Court gave to VCRs in a case between Sony and the film industry in the early 1980s. If this is successful, the court could hold Napster blameless, regardless

of piracy, provided the company can show the service also has substantial legitimate uses. Napster's claim is that it is powerless to distinguish in individual cases whether a download is legal or not.

The judges have been examining whether the Sony ruling applies in Napster's case, asking if its relationship with customers is more direct than Sony's relationship with VCR buyers because it maintains an ongoing relationship as a service provider.

Napster has also accused the RIAA of misapplying the Audio Home Recording Act (AHRA) of 1992 by substituting words in the Act

for ones 'that better suited its purpose'. Napster believes the Act covers its file-sharing application. However, the US federal government, along with entertainment industry groups, filed arguments that Napster's service does not fall under the protection of the AHRA.

Napster has also argued against the RIAA's attempts to insert a Napster exception into the Digital Millennium Copyright Act, claiming that 'it dismantles the framework created by Congress which ensures that Internet companies can continue to function in the face of claims about the actions of their users'.



AGAINST NAPSTER

Metallica, which won its recent court case against Napster, and fellow opponents Eminem and Puff Daddy

argument that the music industry might just as well banish listening posts in record shops. Or to take this theme to its logical – or illogical – conclusion, radio stations ought also to be banned from playing music. After all, if you don't mind the quality, you can easily tape all the music you want from the radio anyway.

But accepting the argument that Napster fans are simply early adopters of tomorrow's preferred music buying methods demonstrates the size of the hole that record companies are in, and how vulnerable they therefore are to the free download model.

Also against the music industry is the acceptance of MP3 as a *de facto* channel by the most influential people of all – music buyers. File-sharing sites look set to prosper and grow, despite all the litigation and technology that the music industry can throw at them, according to recent research.

Forrester Research estimates that the music and book industries combined stand to lose \$4.6b by 2005 to people downloading their intellectual property. The 50 entertainment companies it interviewed – between them responsible for a large proportion of music, films, books, video games and TV programmes – said they will use digital rights management (DRM) technology to stop file sharing.

Forrester analyst Eric Scheirer comments: 'Consumers are demanding access to content by any means necessary. Neither digital security nor lawsuits will stop Internet theft of content.'

Scheirer believes most traditional companies are wrong to focus on using security to control distribution of content. 'That proposition has no future in it. Content won't be controlled and content can't be stopped legally,' he said.

Forrester's report states that the content industry will experience a 'collapse of control' when file sharing satisfies consumer demand for content and transforms distribution-based businesses. This collapse will cause a major shift in the power structures of the music and publishing industries, the report warns.

So what options exist for major entertainment companies? Many believe they need to change into service organisations and develop service offerings for both consumers and artists. They will need production and promotion skills to find, develop and market independent artists, while they'll also have to sell their expertise in production, editorial services and cross-channel brand building.

They say that if you can't beat 'em, join 'em. But so far the industry's attempts at recreating a Napster ambience to answer customer needs have been only partially successful. All five major US record labels will be selling songs over the Internet by the end of the year. However, the search for a universal secure digital content protection scheme to keep the party exclusive is proving elusive.

The Secure Digital Music Initiative, an industry-backed security policy, suffers from disagreements between the record and technology companies. Alternative solutions such as Windows Media Audio may well attract more users and increased manufacturer support.

It should not be assumed that the Napster model is going to get things all its own way, however. Scour, the multimedia file-sharing site, has been forced to slash its workforce because investors have been scared off by fears of litigation by the recording industry.

The company's file-swapping service offers the exchange of video and pictures as well as music. Scour said in a statement a few weeks ago that it had laid off 52 employees – the majority of its workforce – after it was forced to delay its next round of funding. Scour is being sued for copyright infringement by a variety of industry groups, including the Motion Picture Industry of America, the RIAA and the National Music Publishers' Association.

Internet radio, too, has been bedevilled so far by the challenge of paying artist royalties in the manner of conventional radio.

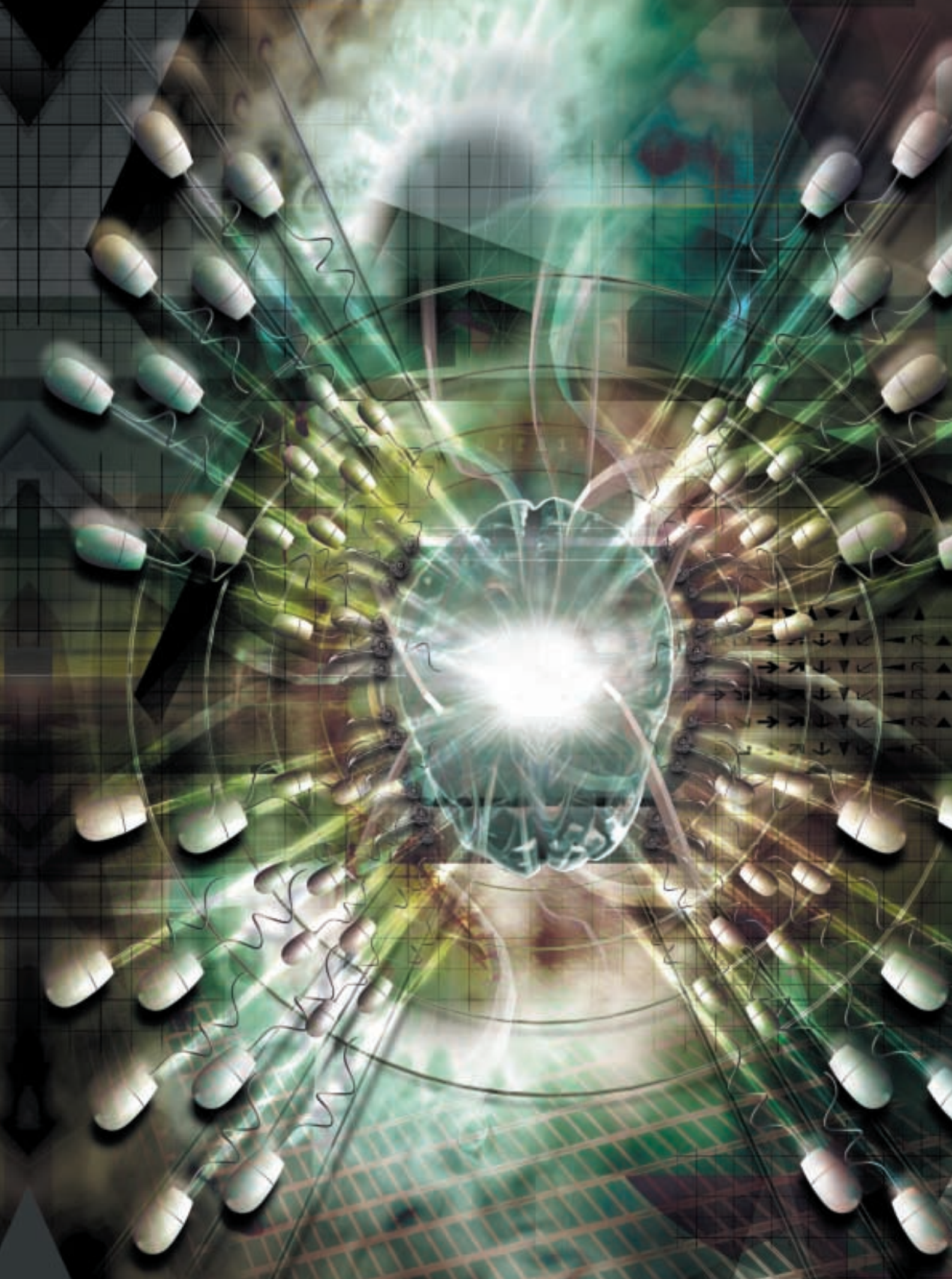
Neither is it entirely correct to view the 'MP3 versus record companies' battle as a host of little Davids against an army of Goliaths. Independent music labels, lacking the firepower of a Universal or a Sony, may fall victim to the MP3 phenomenon sooner than their mainstream rivals.

The monster that Judge Patel said Napster has released is certainly not about to jump voluntarily back into its cage. As it rampages across the landscape of the entertainment world, it will doubtless crush underfoot some defenceless bystanders, as well as knock hard against some monolithic civic structures.

Whether the monster can be brought under some sort of control, or whether counter-attacking will drive it to ever more lawless extremes, remains to be seen.



The Diamond Rio MP3 player uploads an entire album in MP3 format in about three minutes



Mind reader

THE ARTIFICIALLY INTELLIGENT WEB IS GETTING CLOSER, AS IT MASTERS THE HUMAN CAPACITY TO ADAPT FROM EXPERIENCE. JON THOMPSON ASKS IF IT COULD SOON START TO SHOW THE FIRST SIGNS OF CONSCIOUSNESS

IT MAY NOT BE LONG BEFORE the World Wide Web can think for itself. This idea has been around for a while, but the tools to make it possible are only now set to emerge, according to researchers at the Los Alamos National Laboratory and the Free University of Brussels. And that could revolutionise the way we find information online.

Most modern search engines look for web pages that contain the keywords entered, and list any that match, with the closest match first. Most also look for keywords as part of larger words. The results can vary from extremely accurate to downright bizarre, and everyone who's used the web is familiar with the number of 'false' results a search engine gives you.

Now imagine what would happen if the web learnt to spot connections between ideas and link them together, strengthening and weakening the connections as surfers use the links. If the researchers are right, this could be one of the killer applications of the next decade. It may not only do away with keyword searching, but also set us on the path to developing something far more profound.

For instance, if just one user surfs from page A to page B and on to page C, it may be a random event. If, however, 1,000 people all take the same path, then the servers would add a link from page A directly to page C, as there is clearly a strong link between the concepts contained by both. The web, in effect, would learn to associate concepts from experience. This technique is called transivity, and is the basis of neural networks (see Artificial neural networks box).

Researchers think the next generation of search engines could use this technique to transform the web into an artificially intelligent network. They would 'understand' what you are

looking for and retrieve it, widening the scope if your initial search criteria produced no results. The process will become more efficient with each search, as the web learns from previous experience and the links that people follow.

Norman Johnson of the Symbiotic Intelligence Project at Los Alamos even thinks that the famous Turing Test for artificial intelligence may be passed by such a system (see Passing the Turing Test box). The problem so far, he says, has been that current programs can only pass a very limited form of the test. Take them out of their areas of expertise, and they fail miserably. An intelligent web might contain the links that it needs to answer general-purpose questions, and so pass the Turing Test.

Right now, the web is largely hard-wired: it's maintained for the most part by amateur page designers, and the links between its pages are static. While the richness of the links is what makes the web so useful, any improvements or modifications are made by hand.

Typically, as the owner of a site finds other pages related to their own, they create new links and the web grows and evolves. Maintaining even the smallest of websites requires time, dedication and enthusiasm.

Imagine how much more efficient things could be if the web servers on which the pages are hosted could observe the surfing patterns of users and create new links between themselves, based on the popularity of the paths followed through the web. The individual surfers would not be identified and tracked, but the paths they followed would be.

As links between pages are surfed more often, so their importance or 'weight' would increase, using the previously mentioned principle of transivity. Less-followed links would not necessarily be removed but, over time, their weight would decrease accordingly. That way, no associations are lost, in the same

way that everything you have ever experienced is stored in your brain, whether you can remember it readily or not.

This is a good analogy, as there is clearly a parallel with the way the brain physically restructures itself according to experience. The

concepts you think of on a regular basis have very strong links between them, while others you may not have thought of for years can be difficult to recall. The links between them still exist; they are just very weak. A web that learns like this is just another type of neural network.

Francis Heylighen, from the Free University of Brussels, gives an example of how searching the web might change. Suppose your dog continually licks mirrors; you might type 'dog', 'licking' and 'mirror' into a search engine designed for the intelligent web. If a recognised syndrome had been written up, then relevant documents would be returned, based on your keywords alone.

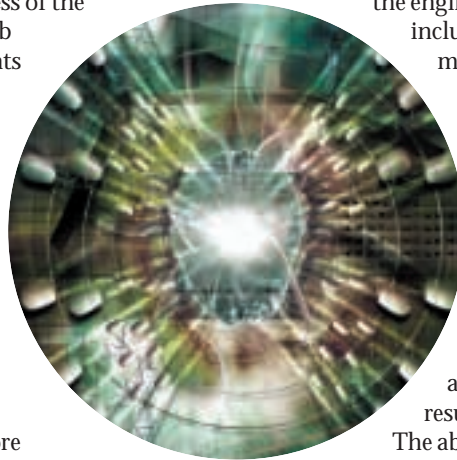
It may be, however, that animals in general like to touch glass, but there is no specific information relating to dogs. If few pages containing the original words are found, the engine would widen its search to include secondary concepts. It may find strong links between 'dog' and 'animal', between 'mirror' and 'glass', or between 'licking' and 'touching'. The search engine has widened its scope without human intervention, and found documents that should still be relevant.

So, even a mechanism as simple as transivity can result in intelligent behaviour.

The ability to understand and call upon secondary concepts is what humans do each time we attempt to solve a problem. If the entire web was given the ability to automatically find and strengthen new links between ideas, then the birth of the first large-scale general artificial intelligence could be just around the corner.

One of the biggest problems with artificial intelligence is computing power. To simulate large numbers of neurons in a software-based neural network is not simple – at least not on a standalone computer. But the web could change that. According to a report at www.slashdot.org, there were an estimated 71 million web servers around the globe in June 2000. That's a lot of computing power, and it could be harnessed to create a large, massively parallel system. That may sound far-fetched, but projects like Seti@home have already shown that complex tasks can be distributed across the Internet.

Amazon.com is already using a form of self-organising capability in its 'People who bought this book also bought...' lists. This simple but incredibly useful technique gives us access to the knowledge of many other previous shoppers. Without these lists, you could literally spend hours online trying to find the right book, especially if you search by keyword alone.



Amazon.com uses a form of intelligent searching with its 'People who bought this book also bought...' lists



Creating an artificial neural network

The first commercially available AI systems were called 'expert systems'. They used a set of rules distilled from the knowledge of many experts in a specific field to arrive at answers. It became rapidly apparent that these systems, although very useful for some jobs, were limited to certain types of problem – largely those with clear rules to follow. This led researchers to think that in order to reproduce human intelligence, with its ability to leap from one topic to another, a system similar to the brain was required.

The bulk of the human brain is made of roughly 10 billion microscopic neurons, all interconnected. Each neuron has inputs, called dendrites, a body where input signals are added together, and a number of outputs, called axons. The axons of one cell connect to the dendrites of another via connections called synapses.

A neuron produces an output if the total strength of

the signals received from all its inputs exceeds a level called its firing threshold. When this happens, it sends signals to its axons, which then travel along the synapses to other neurons, potentially firing them.

The more frequently a particular dendrite receives a signal, the stronger the signal it will pass to its neuron. So, the more often a particular signal is received, the more

likely it is to fire the neuron's outputs.

Pavlov demonstrated this effect with his famous experiment. He rang a bell every time a dog received a meal. After a while, the dog salivated when the bell was rung, indicating that it had learned an association between the sound of the bell and its food arriving.

Artificial neural networks

work in the same way. A typical system is trained by presenting data to the network's input 'neurons'. The weighting of the trigger levels is adjusted to produce the output response required. As the trainer gives the network more data, the weights adjust to associate inputs with outputs. After training with just a handful of patterns, the network becomes capable of recognising that data it has not seen before is similar to that already presented, and should produce the correct response.

Commercially available software-based artificial neural nets – such as Autonomy's web search tool – are limited in what they can achieve by the processing power they need to process data, alter the weights and produce results in a reasonable time. An intelligent web should have no such restrictions – running on the millions of servers around the world, it will by its nature be massively parallel.



Artificial neural nets are limited by the processing power needed

Another, arguably more dubious, application for web-based artificial intelligence is to tailor the banner advertisements found on commercial web pages. Adverts can be given more impact by aiming them directly at the interests of visitors, based on what sites were linked to the one carrying the ads. The ads too would become part of the knowledge stored within the web.

Ben Goetzl, also of the Free University, has carried out an experiment to see how quickly an intelligent web organises itself by concept, without any human intervention. He created a web server with pages giving the 150 most frequently used English nouns. At the start of the experiment, each page was linked randomly to many others. Associated with each link was a unique measure of its strength, which was also given a random value at the beginning of the experiment. This ensured that each word was connected to each other word in the network via at least one route. Some simple transitivity rules were implemented to adjust the strength of the connections between the nouns as surfers used the system.

Starting the browser presented each user with a web page pointing at a random position

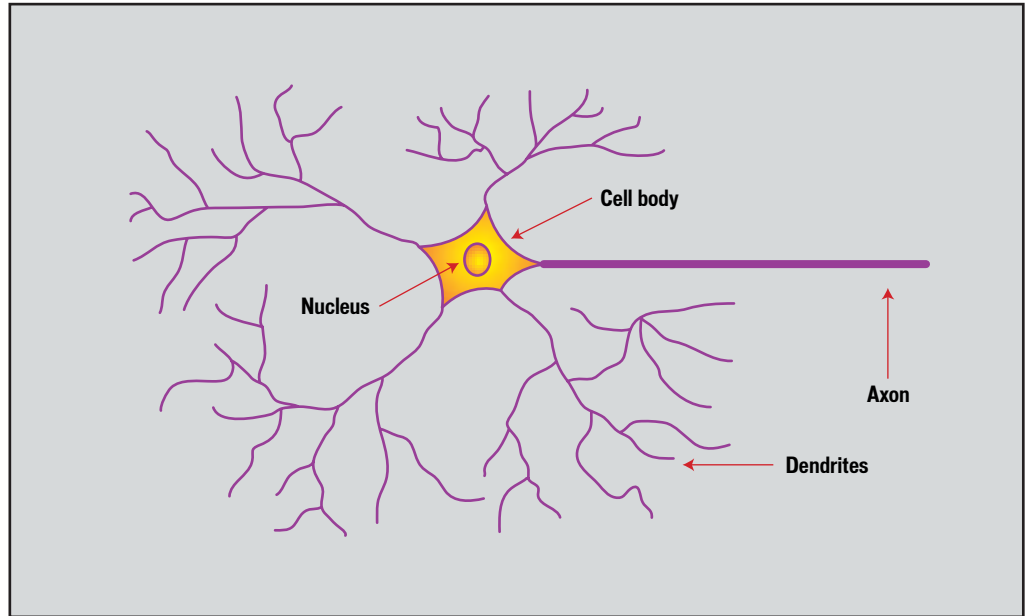
in the network. Each page listed 10 nouns, and the users had to choose the word they thought to be most strongly connected or associated with the current page. Clicking on an entry in the list took them to its page and also told the server about the relative popularity – or strength – of the different links.

As users carried on browsing, the server software automatically sorted the list of related links on each page according to connection strength. To make sure that no unpopular links were left off the list completely, each page had the facility to view the additional links, if the user wished to see them.

After only 2,000 navigations by 200 participants, the development of the network slowed and settled into a fairly stable state. It had, using the transitivity rules, organised itself by concept. This incredibly quick rate of organisation was largely due to the links being sorted on each page by strength. The related words most likely to be chosen were those that were already at the top of the list.

Heylighen has built a similar web, which plays a guessing game based on a game show called *Pyramid*. In *Pyramid*, players have to guess a word given the minimum number of clues

Neurons in the human brain are linked by dendrites and axons



provided by their partners. For example, if the word being guessed is 'boat', then the clues might start with 'water' and progress through 'vehicle' and 'sail' – at which point there would be little doubt about the word being sought.

In Heylighen's system, the user selects a variety of clue words and the search engine has to work out the word being sought. 'Within the limitations of our data [150 web pages], the network seems to play the game as well as a human player,' he said. This suggests that not being able to phrase a question in a precise way doesn't necessarily mean you can't have an accurate answer – potentially a great step forward for searching the Internet.

Johan Bollen of the Distributed Knowledge Systems Group at Los Alamos has gone one step further. He's created the Principia Cybernetica Web, which not only organises its own structure, but also recognises and adapts to individual users as they browse the pages it hosts. Each user sees a personalised version of cyberspace, tailored intelligently to their needs.

For each user, the Principia Cybernetica Web opens new links between pages that it thinks are likely to be used, and closes down others that fall into disuse. The system adapts its behaviour and learns from experience.

As portals become ever more configurable by end users, this mechanism could be used to

Passing the Turing Test

The Turing Test is the only generally accepted method of searching for signs of true artificial intelligence. It is named after its British inventor, the mathematician Alan M Turing, who first described it in a 1950 article entitled *Computing machinery and intelligence*.

The test pitches a human interrogator against a human subject and a computer. The interrogator is connected to both via computer terminals, but doesn't know which is which. The interrogator's task is to find out which of the other two is human and which is the computer. This done by typing questions and receiving answers via the computer

terminals. If the interrogator can't decide which of the two 'people' is the computer within a set period, then the machine passes the test.

A computer has already passed the Turing Test, but only when the questions were restricted to a very tightly controlled area of expertise. If the interrogator asks something the machine doesn't know, or phrases a question badly, the computer is inevitably unmasked.

The hope is that the intelligent web will be able to pass the test in a more general way. Since it has access to related concepts and 'knowledge' of the links between different topics, it



Turing: measuring intelligence

should be able to answer even the vaguest of questions.

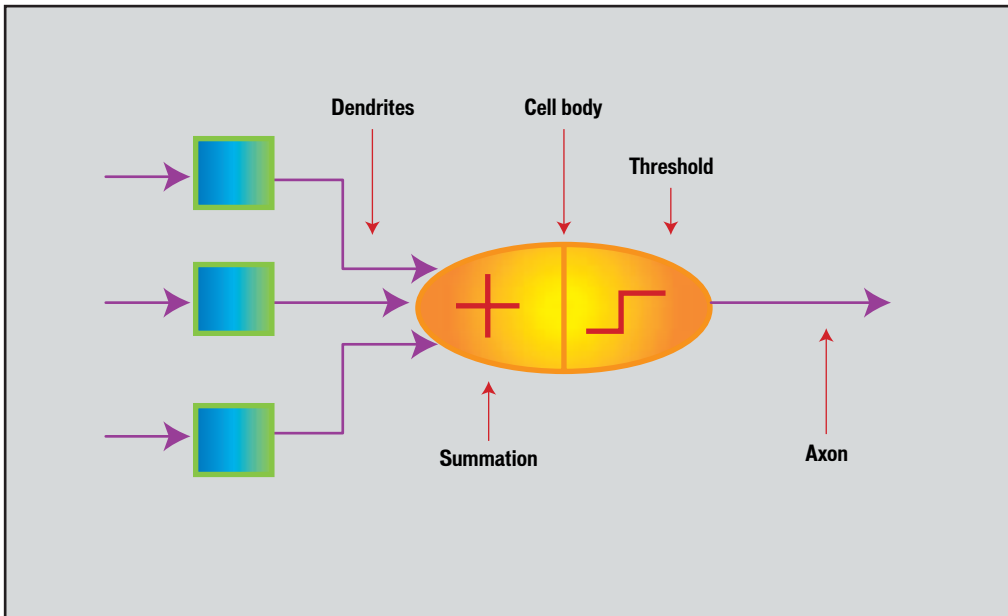
Although widely accepted, the Turing Test has been subject to much criticism over the years. The most significant argument against it is that it

only provides a test for a human type of intelligence. If the intelligent web develops a unique machine-oriented awareness, humans may not even realise it, let alone be able to test for it.

A human, too, can fail the Turing Test, and not necessarily through lack of intelligence. People from different cultures, for example, may not answer questions the way that the operator expects, and could consequently be considered to be the machine.

A classic example is the question: 'If you open a book, on which side is the rear – left or right?' Most Europeans would answer 'right' while most Asians would answer 'left'.

Neurons 'fire' when the sum of their inputs exceeds a threshold



automatically tailor a surfer's view of the web, based on what is being searched for. A farmer might automatically get links to grain prices, for example, because the portal will understand his interests, while a child may automatically find all the Pokémon links their heart desires.

It seems safe to assume that one day virtually the whole of human knowledge will be stored on the web. It also seems likely that some form of transivity will be implemented to take best advantage of this vast storehouse. Intelligent systems, capable of understanding the relationships between concepts linked together via the web, would not be far behind. How will society react to this?

Every innovation has those who embrace it wholeheartedly and those who react adversely – whether for moral reasons, religious ones or just a fear of the unknown. But Heylighen said: 'Not to use an intelligent web will be a little like the people who refuse to use cars or telephones. There have always been people who live outside the bounds of society but they will lead a much more difficult life.'

There is a political context, too. Some totalitarian regimes already distrust the web and seek to limit its use. By cross-matching seemingly unrelated concepts, the intelligent web will make inferences that might uncover 'forbidden' material, making it potentially harder for such regimes to control the flow of information. Perhaps nothing short of an outright ban on its use can prevent this.

While the vast majority of users will surf and search for things of interest, amusement and

personal growth, a small minority may use this awesome power for rather more dubious ends. Could the web help people to find loopholes in laws, allowing illegal activities to flourish, or even create new crimes, by linking information in ways that we might not have imagined?

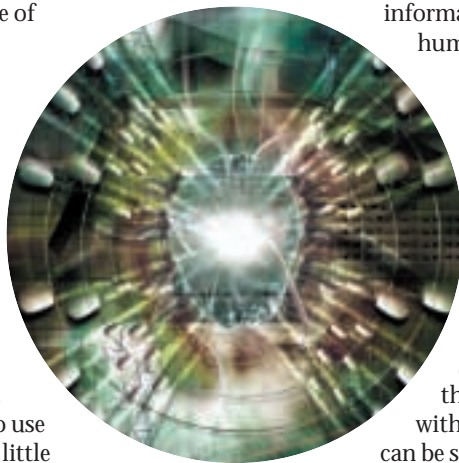
Some researchers even wonder if, given sufficient complexity, the web could start to show the first signs of consciousness. What would it think of us? After all, its brain would contain just about every scrap of information amassed by humankind.

If the web does become self-aware, would we have created a benign helpmate or an unfeeling monster that may do us harm?

Cliff Joslyn of the Los Alamos team said: 'The trick is to first understand from a scientific perspective how such systems behave, and then construct bounds within which such interactions can be safely contained.'

We'd prefer to hope that the strongest connections in the web would be those that are of most interest to the surfing population, so that the concerns of a conscious web would reflect our own. By learning from the links we follow, the web may make itself in our image.

From the upbeat tone of researchers like Heylighen and Goetzl, it seems there are few obstacles to finding out the answers to these questions about the intelligent web. What's needed most is time, and the agreement of the traditionally conservative Internet Engineering Task Force, on the communication protocols needed to underpin the intelligent web and potentially define its – and our – future.



PUT YOUR FINGERPRINT ON THE DOTTED LINE... YOU CAN RUN BUT YOU CAN'T HIDE!

Doctoring the who

HOW DO YOU PROVE YOU'RE YOU? Most personal identification systems are low-tech: a signature, a passport photograph, a memorised password or a PIN. Soon, these will be obsolete. 'Biometric' recognition is set to go mainstream, bringing a host of high-tech ways of finding out if you really are who you say.

Evolving from decades of scattered research, biometrics – measuring your body's characteristics to identify you uniquely – is now recognised as a science in its own right. That achievement was highlighted by the publication a while ago of the first ever book devoted to the subject (*Biometrics: Personal Identification in Networked Society*).

The oldest biometric system is fingerprinting, which has been in use since the late 19th Century. Now you can get automated fingerprint systems for as little as £100 (www.digitalpersona.com), to replace logon passwords for your PC.

If you buy a season ticket to Disney World, you'll only get in if the shape of your hand matches 'your' hand profile in a database. Several other access-control systems now use face recognition (see www.visionics.com).

Iris scanning is another proven method that works by extracting patterns from a video-image of the eye, encoding features such as the colour of the iris, the edge patterns of the pupil, and the reflection of the light from the eye itself (www.iriscan.com). Iris scanning was used for athlete security at the

If your fingerprint doesn't match, you can't get in



1998 Winter Olympics, and several US banks are currently evaluating the technique for staff security.

Like your eyes, the shape of your ears can say a lot about you. In fact, ear prints are now a recognised identification tool in forensic science, and in 1998 a man was sentenced to life imprisonment for murder on the strength of an ear-print he left on a window at the crime scene.

Other methods include analysing your keyboard dynamics – your typing speed and how often you make your own repertoire of typing errors – and using infra-red photography to check the vein patterns in your retina, face, wrist, or hand.

And there are also some slightly unusual methods in development. Computer vision researchers at Southampton University, for example, are trying to recognise people by the way they walk (www.isis.ecs.soton.ac.uk/research/gait). Traditionally, human and animal gait analysis has relied on fixing markers at strategic positions on the limbs being studied. The changing positions of the markers as the subject walks are easy to record, and also allow the actual limb structure to be replaced by a simplified 'stick figure'. For biometric purposes, however, you need to work from video images of people walking, without any markers attached, and this is hard to do. First you have to process each video frame to distinguish the legs from background and foreground features; then you have to track their movement between frames, and find a way to characterise the motion so that it can be compared against a database. Recognising that this is a 'fuzzy' problem, the Southampton team are working on a statistical solution, but don't have one yet.

Then there's odour measurement. Several companies are developing systems that will identify you by your body odour (don't worry, they normally choose to sniff the skin on your hand). Apparently the particular blend of smells cooked up by a human body is unique to each person. But measuring and analysing body odour is hard, since most of us go to extraordinary lengths to mask any trace of it.

Whatever the method, biometrics is coming, like it or not. In the future you're going to find it very hard not to be you.

TOBY HOWARD

PRINTING A 3D OBJECT DIRECT FROM YOUR PC IS NO LONGER JUST SCIENCE FICTION

A new dimension

THE IDEA OF A 'universal fabricator' is a science fiction cliché – a machine that can create anything from raw materials, and conjure magic objects into existence at the touch of a button. In fact, early versions of such a machine already exist. They're called 3D printers, and in a few years they're likely to hit our desktops.

It's been possible to 'print' 3D objects since the mid-1980s, when Charles Hull invented the process. He was experimenting with liquid plastics called photopolymers, which harden on exposure to ultra-violet (UV) light. Hull's insight was that he could create solid objects by building them up, one thin layer at a time.

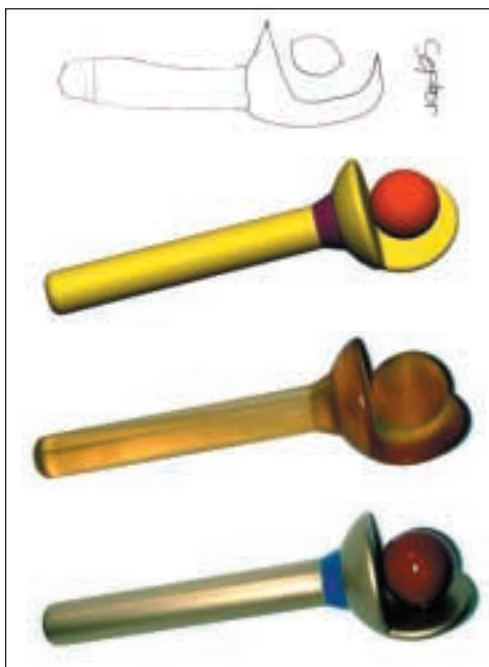
Hull filled a container with liquid polymer, and incorporated a flat shelf that initially sat just below the top level of the liquid. Then he used a computer-controlled beam of UV light to draw out a shape on the surface of the polymer, causing the top few hundredths of a millimetre to harden, into a thin slice. Then, the key idea: the shelf, supporting the now solidified slice of plastic, was lowered down a tiny amount into the liquid polymer, submerging the first hardened layer, and exposing a new layer of liquid polymer to form the next slice. The first object he made this way was a tiny cup, in translucent blue plastic.

Hull called his process 'stereolithography', took out a patent on it, and formed 3D Systems (www.3dsystems.com). In 1987 the company unveiled the world's first commercial 3D printer.

There are now several competing technologies for 3D printing, although the basic idea has remained the same – to build up 3D objects from many thin layers. In the 'laser sintering' process, for example, each layer is built up by depositing a powdered cocktail of ceramic or metal, which is rolled flat and compacted. A laser then traces out a pattern on the powder, which fuses solid under the heat. Once a layer is complete, it's lowered, and a new film of powder is laid down, ready to form the next layer.

SolidScape of Merrimack, New Hampshire, uses another technique (www.solid-scape.com). It sells a machine called the ModelMaker that builds up layers using tiny blobs of molten thermoplastic, sprayed out by nozzles that fly back and forth across the printing surface, just like the heads on an ordinary inkjet printer.

So why don't we all have 3D printers on our desks? One drawback is the cost – around £40,000 per machine. Another is that current 3D printers can only work with single materials,



The founder of toybuilders.com made a sceptre from a drawing his daughter did (top). Half an hour at home on CAD program Solidworks 2000 and the design was complete (second from top). The file was then sent to a Stereolithography Apparatus and after just half an hour two sceptres came out. One sceptre was left unpainted; the other was painted by father and daughter

although it is now possible to colour different parts of the object using coloured ink granules added to the mix. A new machine from Massachusetts company Z Corporation does just this and the firm claims it is a world first (www.zcorp.com).

Like many emerging technologies, we'll have to wait until a killer application emerges to push it out of the labs and into the marketplace. Some industry insiders think they've already identified it – in the shape of the 'Santa Claus machine'. Yes, you guessed it, 3D printers designed to make kids' toys, in the comfort of your own home. One company is already offering to fabricate toys to your specifications – you send them a sketch and they 3D-print the finished article (www.toybuilders.com).

The technology is advancing rapidly, and desktop machines can't be far away. But as one wag on the web put it: a 3D printer sounds just dandy, but can it make me a pizza?

TOBY HOWARD

Stereolithography in action



Best of



the Best

Is a computer on your list to Santa this year? We asked all the PC manufacturers that won a coveted PCW award during 2000 to send us their best-value PC, so you get a top prezzie this Christmas

Each month the pages of PCW are filled with the best and the not so good PCs, and each month a handful of vendors walk away with coveted PCW awards. This month we've gone back over the past year and picked out every winning PC manufacturer to have appeared in these pages. We contacted all of those who walked away with a Recommended, Highly Commended or, most coveted of all, an Editor's Choice award, and invited them back to fight it out in the most hotly contested battle of all – our annual Best of the Best group test.

This is each manufacturer's chance to show us what they can really do. We left the specification open, setting no price point, but telling each that we were more interested in value for money than anything else. By all means submit an £800 wonder, we told them, but don't cut too many corners. Equally, those opting for the other end of the scale and entering machines costing more than £2,000 would have to be sure we wouldn't feel we were being diddled.

We told them – give us what you think will be your biggest seller this Christmas. Then we sat back and waited. And this is what arrived...

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Atlas Meridian A1100 CW



impressive. Evesham's PC has 256MB of PC133 SDRAM and a 1.2GHz processor, compared to the Atlas' 1.1GHz processor and 128MB of PC133 RAM. There is only one point in it, but logically, the Atlas just shouldn't have won. The Asus A7V motherboard is the only relevant factor that can account for the better performance.

The motherboard has UltraDMA100 support, allowing the good-sized 46.1GB IBM Deskstar to run at its optimum level.

ATLAS MANAGES TO take fairly standard components and somehow produce benchmark results that have a tendency to beat higher-spec systems, as well as keeping the price down (relatively). This system costs just £1,699 ex VAT which, considering both the spec and the performance, is quite incredible, and it turned in a SYSmark score of 198. Comparing the relevant hardware to the result of the highest clocked machine, from evesham.com, is

As for optical storage, the installed CD writer is a Teac CD-W54E, providing four-speed writing and rewriting. The Hitachi DVD drive delivers 12-speed DVD and 40-speed CD reading.

The Atlas has four PCI slots and one shared PCI/AMR, leaving two PCI slots free, the other being filled by the VideoLogic SonicFury sound card (which pipes to the VideoLogic DigiTheatre LC speakers), and the Diamond Supra modem. As for the case,

with one 5.25in and two 3.5in bays free, this PC has plenty scope for upgrade. And if you don't want to upgrade internally, the system has four rear USB ports for connection of external peripherals.

The video card is the 64MB Leadtek WinFast GeForce2 GTS. This excellent card has S-Video out for connection to a television, and if you just want to use the monitor, the 19in CTX PR960F provides an excellent Trinitron display. With a bundle that includes a couple of Logitech gaming peripherals, Microsoft Works 2000 and games including Driver, this is an ideal system for work or fun. Considering the price, it would be hard not to recommend this system.

DETAILS

PRICE £1,996.33 (£1,699 ex VAT)

CONTACT Atlas 07000 285 275

www.atlasplc.com

PROS Fair price; great performance

CONS Microsoft Works Suite would have been preferable

OVERALL An impressive system that won't cost the earth

FEATURES

PERFORMANCE ★★★★★

VALUE FOR MONEY ★★★★★

OVERALL RATING ★★★★★



Elonex WebRider Pro



The processor is one of the few Pentium IIIs we've seen running at a clock speed of 933MHz. As for memory, 256MB of PC133 memory is installed in a single bank, leaving two DIMMs free for upgrade.

Upgrade potential on this system is good, with two 3.5in bays free and one 5.25in bay. The motherboard has four PCI slots, of which two are free, as is the shared PCI/ISA slot. An AMR slot is occupied by the HAMR 56K modem. The

LIKE THE SYSTEMAX, the Elonex has a 30.7GB Maxtor hard disk that runs at below its potential bandwidth due to the limitations of the motherboard. Its MSI VIA 694X chipset-based board supports up to UltraDMA66, so the UltraDMA100 drive cannot run at its optimum. An Acer eight-speed write, four-speed rewrite drive deals with removable storage, while a 16-speed DVD (40-speed CD) from the same manufacturer covers optical reading.

occupied PCI slots are filled by a SoundBlaster Live! 1024 retail card (with an internal SP-DIF connector), while the other houses a Hauppauge Win TV tuner card, which comes with a remote control. The speaker system is a four-point surround system that provides pretty good sound, although it does not utilise the digital output possibilities of the SB Live! card.

A 32MB Hercules 3D Prophet II sits in the AGP slot provided for the

system's graphics generation. This 32MB card is not as fast as the 64MB version of the Prophet II, but for most games and for general use, it is ideal. The card drives a Vision Master Pro 450 19in monitor from Iiyama, which has an image that is sharp with vibrant colours.

With Windows Me installed and no other software included except Nero Burning ROM CD-writing software, this Elonex is generally uninspiring, despite having a TV tuner card. It does come with a Logitech QuickCam Web, but a better motherboard would have been a more useful addition. At £1,996.32, it is not the best-value system in the test.

DETAILS

PRICE £1,996.33 (1,699 ex VAT)

CONTACT Elonex 020 8452 4444

www.elonex.co.uk

PROS TV tuner card; 256MB of PC133 memory

CONS No UltraDMA100 support; quite expensive

OVERALL The specification of this machine does not live up to its price tag. It does have a TV tuner card and lots of fast memory, but this isn't enough to make it a £2,000 system

FEATURES

PERFORMANCE ★★★

VALUE FOR MONEY ★★★

OVERALL RATING ★★★

evesham.com Origin 1200



THIS MACHINE HAS a 1.2GHz Athlon with the biggest heatsink we've seen on a socket processor. It also boasts 256MB of PC133 SDRAM and a GeForce2 Ultra graphics card with 64MB of onboard memory. You would expect it to be lightning fast – and you'd be right.

But considering these components, we'd have expected it to be faster. With a SYSmark score of 197, the speed can't really be criticised. However, some other manufacturers have managed to eke out

similar results from lower clocked processors – and with an overall lower price (see Atlas review).

The problem is due to the motherboard – the Chaintech CT-7AJA just isn't as fast as some other motherboards available right now. It does support UltraDMA100, so the 40.9GB Maxtor hard disk is running at its maximum potential, and as the other components are excellent, the overall slowness of the motherboard is the

weak link in this system. The optical devices installed are a Panasonic CD-RW and a Pioneer DVD-115, providing eight-speed CD writing, four-speed rewriting, 16-speed DVD reading and 40-speed CD reading between them. The sound card and speaker solution is equally high in quality. The sound card is the SoundBlaster Live! 1024 that pumps its digital output to the VideoLogic DigiTheatre speaker system for excellent

all-round sound. The monitor is a 19in Mitsubishi Diamond Plus 91 which, as noted above, is fed by the GeForce2 Ultra card.

As for upgradability, three PCI slots and one shared PCI/ISA are free. There is an AMR, but the modem is installed here. As for drive bays, with none empty you won't be adding any further hard disks without replacing the one currently installed. There is one DIMM free for memory upgrading.

Although this is a fast system, it is disappointing. It may have the fastest clocked processor in the test, but with the lack of drive upgrade space and a poor motherboard, £1,999 ex VAT is a lot of cash to fork out.

DETAILS

PRICE £2,348.83 (£1,999 ex VAT)

CONTACT evesham.com 0800 038 0800

www.evesham.com

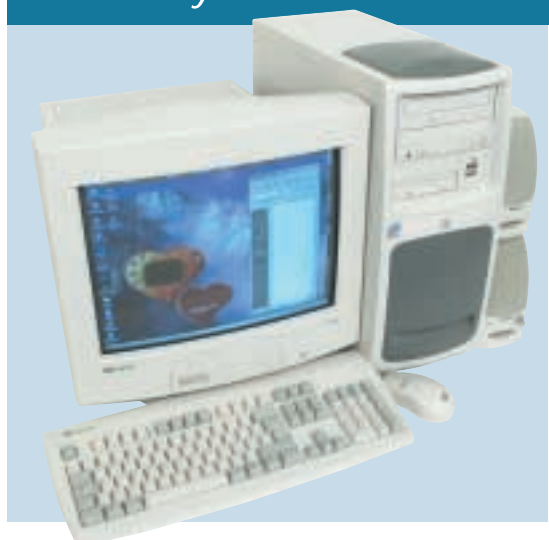
PROS GeForce2 Ultra; 1.2GHz processor

CONS The motherboard lets the system down

OVERALL With a different motherboard, this would have been an excellent system. As it is, it is just a very good system

| | |
|------------------------|-------|
| FEATURES | ★★★★ |
| PERFORMANCE | ★★★★★ |
| VALUE FOR MONEY | ★★★★ |
| OVERALL RATING | ★★★★★ |

Gateway Performance 866



THE CASE ON THE Gateway is appealing in that it's a little less dowdy than most, and is screw-free for drive mounting. It also has the benefit of two unobtrusive USB ports in the front, which Gateway has thankfully decided should not be under a flap as is usually the case with front-mounted USB ports.

At 866MHz, the Pentium III processor is the lowest clocked in this test, although it manages to push the system to a respectable SYSmark score of 158. The

installed memory is 128MB of PC133 SDRAM. This sits in one of the three available DIMM slots, leaving two free.

Of the four PCI slots on the Intel 815E motherboard, three remain free, the other being filled by the cut-down SoundBlaster PCI 128 sound card, which doesn't have a joystick port (probably because Gateway correctly thinks you will want to plug a USB gaming peripheral into the front, so you don't need it permanently connected). This card is a

bit behind the times, with most manufacturers these days opting for the SoundBlaster Live! 1024. The PCI/CNR shared slot is filled by a 56K PCI modem.

Fixed storage comes in the form of a 20.5GB Western Digital hard disk, the smallest drive in the tests. A Panasonic DVD with 16-speed DVD and 40-speed CD reading covers optical storage, while a Philips CD writer provides eight-speed writing and four-speed rewriting.

Dealing with the graphics is a TNT2 M64 video card. This, although a reasonable chipset, is getting long in the tooth, and with GeForce2 MX cards available it is not the best low-cost solution. The monitor, Gateway's 17in EV700, provides a fair image, although the colours are not wonderfully bright. As for the speaker system, Boston Acoustics' BA265 set is included.

Overall, the Gateway has some good and some bad features. Its specification is not cutting edge, although it only costs £999 ex VAT. As a relatively low-cost solution it is fair, although a better graphics solution would have made it far more desirable.

DETAILS

PRICE £1,173.83 (£999 ex VAT)

CONTACT Gateway 0800 552 000

www.gateway.com/uk

PROS Good case; front USB ports

CONS TNT2 card and SoundBlaster PCI 128 are quite old components

OVERALL This system is largely good value, although the sound and video cards could be better

| | |
|------------------------|-------|
| FEATURES | ★★ |
| PERFORMANCE | ★★★★ |
| VALUE FOR MONEY | ★★★★★ |
| OVERALL RATING | ★★★★ |



Mesh Matrix 1000BB



On a more positive note, the Asus A7V motherboard put to use in the Matrix has plenty of room for expansion. Two memory slots sit empty, and there's a shared PCI/ISA slot and a PCI slot going begging. The hard drive is a 30.7GB IBM Deskstar that should be more than enough for most users for some time yet. Should you feel the need to add to it at some future date then there's one of each of the drive bays waiting to be filled.

THE NAME GIVES AWAY the processor here – it's another socketed 1GHz AMD Athlon, which Mesh has wisely opted to support with 128MB of PC133 memory.

Mesh has come in at a price point also chosen by two others this month, although for the money the others have more to offer: NEC has doubled the size of the hard drive and packed the box with goodies; and Time has thrown in a large software and hardware bundle.

Backup is handled by a Teac CD-W54E drive, which sits happily with Pioneer's popular DVD-115 drive. The latter unit is a popular choice, seen in several review machines each month, reading DVDs at 16-speed. Graphics are handled by an ATI Radeon with a massive 64MB of DDR memory, pushing its output to a 17in Mitsubishi Diamond Pro 720. With a 16in viewable diagonal, this is one of our favourite monitors, sporting a perfectly respectable flicker-free

75Hz refresh rate when set to 1,600 x 1,200 resolution.

Sound arrives through Cambridge Soundworks FPS1000 speakers, which get their signals from the Creative SoundBlaster Live! 1024 sound card. If your family constantly fights over the telly at Christmas, the Matrix will help you get away from it all... kick back and tune into your choice with the ATi PCI TV Wonder Tuner. The operating system is still Windows 98 SE, but it does the job fine. The only thing that is missing are a few more add-ons.

In all, this is a well-rounded machine with plenty to offer, but there are alternatives here that look better when you compare their specs with the price.

DETAILS

PRICE £1,526.33 (£1,299 ex VAT)

CONTACT Mesh 020 8208 4706

www.meshcomputers.com

PROS Good graphics card

CONS Falls down on value for money

OVERALL You can't argue that this isn't a good machine, but there are others that offer more for the money

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★★★★
★★★★
★★★★
★★★★

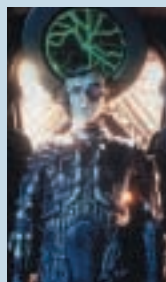
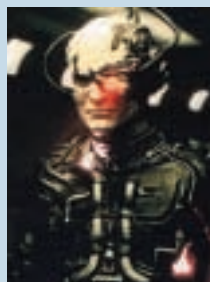
2001: a PC odyssey

With the new year – the real millennium some might argue – just around the corner, who knows what the future might bring? Speculation is always a tricky business, but let us, for a moment, not worry about that and instead ponder what might be in store for the PC.

Many of us have pretty much got the hang of using the PC as a word processor, gaming tool and for browsing the Internet, but what exciting new developments lie ahead of us? Well, one thing that will stay at the forefront is that everlasting bone of contention, processor speed. Will the megahertz – or for that matter gigahertz – keep on piling up? Probably, but noises are being made over the downsizing question. This is not so much about processor speed, but about form factor and mobility.

Earlier this year in Taipei, Bill Gates set out his vision of how computing would still revolve around the PC, though

this would be in a more portable and powerful form than currently. Granted, the PC already seems to be heading that way with what can only be described as a shift from its role as a creativity tool to one that slants towards the



communication age. However, this shift has begun to gather pace, but instead of embracing the PC – with its keyboard and mouse – many tech gurus are forecasting a 'post-PC era', where the user will perform their computing tasks over the Internet, using devices such as PDAs, mobile phones and set-top boxes.

However, there is one major limitation at the moment and that's the problem of bandwidth. High-speed broadband connections are still largely unavailable to the masses with telephone companies taking time to

relinquish their highly profitable grip on the telephone network. It is only when this grip is relaxed, and when the costs come down, that the Internet will become less of a 'presentation network' and more an integral part of the applications running on a PC.

So where does this leave the

humble PC? Probably highly moulded into some form of all-singing, all-dancing tablet, permanently connected to the Internet, with a built-in mic and camera, some wireless technology and all topped off with speech and handwriting recognition. Perhaps...

But you cannot deny that these are the noises coming from the main players – they envisage a future where you will be able to take your tablet-like PC into a meeting and access your business information online, then come home and use it to control multimedia over your wireless network.

However, as with many predictions something is always left out. Will the limiting factor of all this bombardment with new technology and wealth of information be the human brain itself? Might that be the piece of equipment to become overloaded?

JALAL WERFALLI

Multivision Vision Elite A850 XL



an UltraDMA66 model, this is of little consequence. The motherboard has five PCI slots and one shared ISA/PCI. Of these, the shared slot and three PCIs are free, while a Motorola modem and SoundBlaster Live! 1024 sound card occupy the others. This pipes out to an excellent digital sound system using the Cambridge Soundworks speaker set.

The two optical drives installed are a Mirai CD writer and a Hitachi DVD. The Mirai Burn-Proof is a first-class unit that writes

CD media at 12-speed and rewrites at four-speed. The Hitachi drive reads DVDs at a fairly slow eight-speed, and CDs at 40-speed.

The low-cost GeForce2 MX card from Hercules processes the graphics. This 32MB 3D Prophet II MX is an ideal solution for low-cost graphics. It's not as fast as the full-blown GeForce2, but is fairly good despite this. The image on the fine 17in Hansol monitor is fairly focused, although the colours

THE VISION ELITE has an 850MHz Athlon in the driving seat and with 128MB of PC100 memory, it only managed a SYSmark score of 143, relegating it towards the bottom of the performance charts. If you want more speed, two spare DIMM slots are free for future memory additions.

The EPoX motherboard uses the VIA KT133 chipset. The board does not support UltraDMA100, but considering the 30.6GB Seagate Barracuda drive is

are not as vibrant as on some of the other units here.

The system comes with Windows Millennium and Lotus SmartSuite. The MX card has some demos (including Tachyon: The Fringe and Daikatana), but there are no full games bundles. There are no extra peripherals – a shame as other manufacturers included a few extra items for those cold nights in.

Nevertheless, the Vision Elite is not a bad system, and it is inexpensive at £999 ex VAT. Upgrading the processor to the 1GHz Athlon would see it rise to the middle of the performance charts.

DETAILS

PRICE £1,173 (£999 ex VAT)
CONTACT Multivision 0121 550 8000
www.multivision.co.uk

PROS Excellent Mirai Burn-Proof CD writer; GeForce2 MX card; excellent speaker system

CONS No UltraDMA100 support; slow DVD reading

OVERALL It may not be absolutely cutting edge, but this system is good value. It has excellent sound, a good graphics solution and a quality CD writer

| | |
|------------------------|------|
| FEATURES | ★★★★ |
| PERFORMANCE | ★★★★ |
| VALUE FOR MONEY | ★★★★ |
| OVERALL RATING | ★★★★ |

NEC Direction SM-1000A



Quantum Fireball. At 60GB, it shares the top spot with the IBM Deskstar in this month's Panrix. Everything is mounted on MSI's MS6340 motherboard, built around the VIA KT133 chipset. With only a shared two PCI and one shared slots, there isn't too much potential for expansion cards, and as only the shared slot remains free it'll not be long before you find yourself swapping out what's already there.

Perhaps more unusual

is the fact that the backing plate features only one PS/2 port. In its favour, though, there are three USB ports, so there's plenty of space for keyboards and mice. Optical storage is handled courtesy of a Sony CRX 140E CD burner and a 16-speed Pioneer DVD-115. Decoding is taken care of by an nVidia GeForce2 GTS card sporting 32MB of DDR memory. The monitor is a generous 19in model with an 18in viewable diagonal. Its top flicker-free

AMD'S SOCKETED 1GHz Athlon appears once again in this offering from NEC, accompanied by what is fast becoming the standard allocation of RAM, 128MB, in the form of a single PC133 stick. This puts it behind some of the other PCs this month, but it's still more than enough to keep most users happy. If you do start to feel the pinch in the not too distant future, though, there's a second slot for upgrades.

The hard drive is a cavernous

resolution is a more than respectable 85Hz at 1,600 x 1,200.

PCs are no fun without a voice, and in this case it's provided by a SoundBlaster Live! Value card and set of Labtec LCS 2414 speakers – more than enough for the average home user. There's also a 56K Connexant PCI modem to get you online.

This rather mediocre PC is balanced by a generous complimentary bundle that includes Hauppauge WinTV-USB, a Logitech web cam, a microphone headset, Works Suite 2000 and Flight Simulator 98. We were also glad to see that NEC was among the majority when it came to choice of OS, and opted for Windows Me. A well-rounded PC.

DETAILS

PRICE £1,526.33 (£1,299 ex VAT)
CONTACT NEC Computers 0870 010 6322
www.nec-online.co.uk

PROS Fair price; large monitor with respectable resolution; good bundle

CONS Limited expansion potential

OVERALL This is a good PC today, but it may age quickly

| | |
|------------------------|------|
| FEATURES | ★★★★ |
| PERFORMANCE | ★★★★ |
| VALUE FOR MONEY | ★★★★ |
| OVERALL RATING | ★★★★ |



Panrix Magnum Pro



PANRIX GENERALLY builds good-quality machines, and this one is no exception. The case is spacious and it has an excellent convection fan system keeping the innards nice and cool. The 1GHz Athlon processor sits on an Asus A7V motherboard, with one 256MB DIMM slotted into one of the three available sockets, leaving two free for upgrade. The memory is PC133.

Occupying two of the four PCI slots are the modem and the VideoLogic

SonicFury sound card. The shared AMR/PCI slot is free, although the motherboard's extra USB bracket blocks the slots, so you will need to move the bracket to add a card in the shared slot. The sound card pipes to four-point surround speakers. Although not digital speakers, they provide an adequate sound system.

A Radeon card from ATI deals with graphics. This 64MB card has Video In and Video Out, and also boasts some of the best DVD video

decompression of a non-dedicated card. The monitor supplied is a Mitsubishi Diamond Plus 91. This 19in unit has a good screen image and fairly good colour representation.

The hard disk is a massive 60GB IBM Deskstar. This drive is so large it would be a good idea to split it into more easily organised partitions. However you organise the drive, though, storage space will not be an issue for quite a while. Hewlett-Packard's CD writer

9110i takes care of removable storage, while a 16-speed slot-loading DVD reader (with 40-speed CD reading) from AOpen sits above it. There is one free 5.25in and two 3.5in bays free for the addition of further drives.

The system has Windows Me installed, and the only other software that is included is an eight-game bundle including Mech Warrior 3 and Roller Coaster Tycoon. A more comprehensive office package would have been useful, but with this Panrix at least you've got some excellent hardware on which to install any software you buy – although for £2,344.13 we would perhaps have expected more software with the bundle.

DETAILS

PRICE £2,344.13 (£1,995 ex VAT)

CONTACT Panrix 0113 244 4958

www.panrix.com

PROS Excellent specification all round...

CONS ...apart from the speakers, which aren't digital

OVERALL It may be expensive, but you get a fine system for your money

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★★★★

★★★★

★★★★

★★★★

Systemax A1000RV Lifestyle



THIS SYSTEMAX COMES with a cordless keyboard and mouse from Logitech. Whether or not you consider this to be a good thing is down to personal preference. It does, however, mean that the keyboard can be located and used up to about two metres away from the receiver.

Apart from this ethereal technology, the system has the now almost standard 1GHz processor, backed by 128MB of PC133 memory. Two DIMM slots

remain vacant for upgrade. The motherboard is made by Biostar, using the KT133 chipset.

This board has four PCI slots, one shared PCI/ISA, and an AMR above the AGP slot. Occupying three of the PCI slots are the modem, a TV tuner card and a VideoLogic SonicFury that pipes out to an excellent digital sound system in the form of VideoLogic DigiTheatre LC speakers. The shared and AMR slots are free for additional hardware.

A slot-loading Pioneer DVD drive provides 16-speed DVD reading and 40-speed CD reading, while for removable optical storage an Iomega Zip CD provides eight-speed writing and four-speed rewriting. Internal storage is provided by a 30.7GB hard disk from Maxtor. This is an UltraDMA100 drive, although the motherboard does not support this feature so its bandwidth is limited to 66Mbytes/sec. Graphics are processed by a 3D Power GeForce2 MX

card that drives a 19in Mitsubishi Diamond Plus 91 monitor. The card has 32MB of SDRAM onboard.

The Systemax is a capable bundle for the new user, coming complete with a Xerox colour inkjet printer (replete with printer cable) and a Umax scanner. For more advanced users, these extras will not be so appealing.

A Microsoft Sidewinder Gamepad Pro is included for the gamer, while a WebCam Go from Creative is bundled for a bit of fun and versatility. Lotus SmartSuite provides a fair office package, making this a good all-round system for the new PC user. At £1,499 ex VAT the price isn't too distressing, either.

DETAILS

PRICE £1,761 (£1,499 ex VAT)

CONTACT Simply 08707 297 366

www.simply.co.uk

PROS Excellent speaker system; 19in monitor

CONS No UltraDMA100 support from the motherboard

OVERALL As a complete system this has it all, and it won't totally break the bank

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING



★★★★★

★★★★

★★★★

★★★★

Time Machine 1000-7 VQ Pro



UltraDMA66 Seagate Barracuda unit. Again, it's going to take you a while to fill it, but if you find tomorrow's bloatware applications banging their heads on the capacity ceiling there's room in the case to add a further three devices – two 3.5in and one 5.25in. The case sports no fewer than five USB ports, which is truly impressive, and a sign of a company looking to the future. These are backed by two serial, two PS/2 and one parallel port. As

THE TIME MACHINE is one of five machines in this month's test sporting AMD's 1GHz Athlon processor, and it joins a far larger crowd opting for 128MB of RAM. This will be ample for most users, but if you consider yourself a power user you might like to take advantage of the two spare slots that will allow you to increase this to a maximum of 1.1GB without throwing away what is already in place.

The hard drive is a 30.6GB

far as expansion potential goes, there's room for manoeuvre there, too – two PCI and a shared slot lie vacant.

In common with Altas, Panrix and Mesh, Time uses Asus' A7V motherboard with VIA KT133 chipset. This has UltraDMA100 support so it's a shame that Time didn't take advantage of the capacity with a drive to match. In practice, you'd never fill the bandwidth offered by an UltraDMA100 interface, but it's nice to have a matching set.

Optical backup is catered for by the inclusion of LG's CED-8083B CD burner, and to make disc-to-disc copies easy Pioneer's 10-speed DVD-104S drive is included. The graphics card is a 3D Prophet II GTS from Hercules, using nVidia's GeForce2 GTS chipset. This sends its output to a 19in Samsung Samtron 95P Plus monitor with an 18in viewable diagonal. At 1,600 x 1,200, this supports a flicker-free 75Hz refresh rate.

As you might expect from Time a generous bundle is included, although don't expect too much from the low-resolution digital camera.

There is, however, plenty to keep you entertained – we just wish Time had opted for Windows Me as the OS rather than 98 SE.

DETAILS

PRICE £1,526.33 (£1,299 ex VAT)

CONTACT Time Computers

01282 777 555 www.timecomputers.com

PROS Good price; large monitor

CONS Outdated operating system

OVERALL A fair system at a fair price



FEATURES

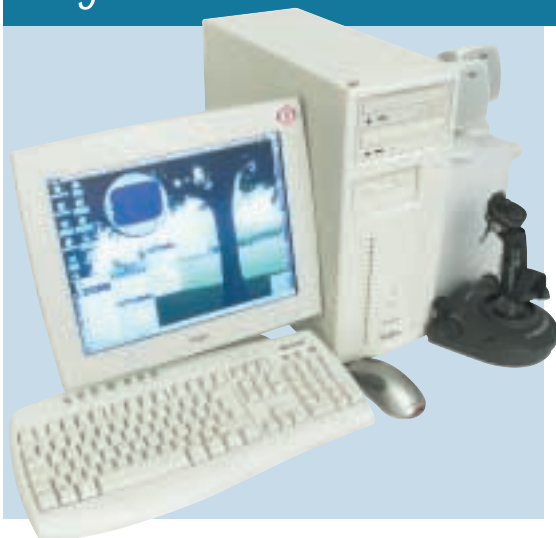
PERFORMANCE

VALUE FOR MONEY

OVERALL RATING



Viglen HomePro P3-1000JWR



free 3.5in bays, although with only one connector on one EIDE cable free, just one can be filled.

The motherboard has five PCI slots and room for an AGP card. Three of the PCI slots are free, with the other two occupied by the modem and the SoundBlaster Live! 1024 sound card. The speakers are Altec Lansing ACS33s, a basic two-speaker and sub-woofer set. A 3D Power GeForce2 card sits in the AGP slot, with 32MB of onboard SGRAM memory. This drives the

THE LAST OF THE Pentium III systems this month, the Viglen is the fastest clocked example, running at 1GHz. The supporting memory is 128MB of PC133, which comes as one stick, leaving two DIMMs free for upgrade. The motherboard uses Intel's 815E chipset, giving support for UltraDMA100. Unfortunately, the 30.6GB Seagate Barracuda hard disk cannot take full advantage of this as it is an UltraDMA66 drive. The case has two

15in Viglen-badged Mitac 15RX flat panel, which provides a sharp image and has fairly even colour regulation and intensity across the screen.

The optical drives installed are a Sony CRX140E CD writer and a Pioneer DVD-115. The writer writes at eight-speed and rewrites at four-speed, while the Pioneer drive reads DVD and CDs at 16-speed and 40-speed respectively.

The system comes with Windows Me installed and Microsoft Works Suite

2000, so for work this machine is ready to go. For the gamer, a Saitek Cyborg joystick is bundled.

The motherboard has an onboard network capability that may be of relevance to some, with the output sitting by the USB ports to the rear. The performance of this system is not magnificent, with a mediocre SYSmark score. So if it's a fast machine you want, you may need to look elsewhere.

If you need a PC for business, and can afford the £1,940 price tag, both the onboard network aspect and the stylish screen make this one to consider.

DETAILS

PRICE £1,940.50 (£1,651.49 ex VAT)

CONTACT Viglen 020 8758 7000

www.viglen.co.uk

PROS TFT screen; onboard networking

CONS Very expensive; no UltraDMA100 support (which we'd expect for the cost)

OVERALL This unit will appeal to the business environment more than the home user. It is expensive, but the screen makes it a stylish office PC

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING





How we did the tests

SYSmark 2000

This comprises 12 application workloads and a management program. The workloads are divided into two categories: office productivity and Internet content creation. We run the benchmark at a resolution of 1,024 x 768 in 16bit colour. It loops three times, rebooting between each workload.

It then assigns the system a performance rating for each application, based on a comparison of workload runtimes between the system being tested and a fixed calibration platform. A rating of 100 indicates the test system has performance equal to that of the calibration platform, 200 indicates twice the performance and so on. The calibration platform is based on a Pentium III 450MHz processor, an Intel 440BX chipset motherboard, 128MB of SDRAM, a 32MB Diamond Viper V770 Ultra graphics card, an IBM DJNA 371800 and Windows 98 SE.

Each category rating is a geometric mean of the workload ratings in that category. The overall rating is a weighted geometric mean of the category ratings.

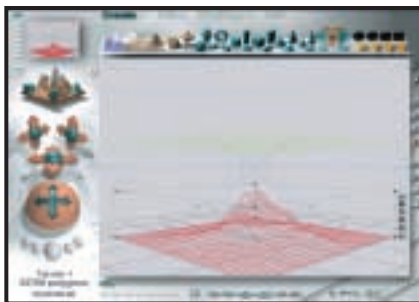
Office productivity

Corel CorelDraw 9.0

This script first takes an abstract design, applies an Art Stroke to it and runs various filter effects. It creates and manipulates a scene composed of vector graphics. Next, it takes a raster image and applies effects. It creates several 3D objects and performs 3D manipulations.

Corel Paradox 9.0

This performs SQL-style queries on a database table and runs a 'find duplicates' query. It imports other text files, formatting and exporting each to HTML. Then it opens up query forms, enters



Bryce 4 script manipulates a wire frame scene and renders it

charts, applying graphics and sound effects, and adding movie files.

additional data and produces reports based on queries.

Microsoft Word 2000

This workload invokes word processing functions, including editing, spell checking, search and replace, font change, copy and paste, print preview, mail merge fields, insert hyperlinks, background and table formatting plus opening and viewing HTML pages.

Microsoft Excel 2000

Operations include closing and opening spreadsheets, HTML pages and data in text files, spell checks, formula calculation, plotting data, formatting charts and cells, analysing data in pivot tables, naming a cell and inserting hyperlinks.

Microsoft PowerPoint 2000

Operations include spell checks, editing, formatting and moving pictures, applying templates, formatting tables in slides, inserting hyperlinks, applying header and footer data, formatting

3DMark 2000 tests each system's DirectX performance (above) and OpenGL performance is tested via Quake III: Arena (right)

Dragon NaturallySpeaking Preferred 4.0

The script plays a pre-recorded wav file into NaturallySpeaking, which then converts the wav file to text.

Netscape

Communicator 4.61

This opens a website of plays by Shakespeare and selects and loads the texts several times. Then it loads a page consisting of large tables, thumbnails and images and cycles through viewing the images.

Internet content creation

Adobe Premiere 5.1

This creates an animation of about 16 bmp files and other avi clips and puts transitions between them. It superimposes two audio tracks and runs the audio through filters.



Adobe Photoshop 5.5

The script loads, resizes, zooms out of images, applies filters to the images, changes mode and colour settings, adjusts image brightness and contrast and saves the image to a jpeg file.

Avid Elastic Reality 3.1

The workload sets up and renders a morph between two mpeg2-sized images (720 x 480 pixels, roughly 750KB).

MetaCreations Bryce 4

This script opens an assembled wire frame scene and renders it to the final image. Then a new image is opened and saved in Metastream format. Another image is opened and saved in an HTML-compatible format.

Microsoft Windows Media Encoder 4.0

The input file is an avi clip that is encoded using the mpeg4 Video Codec.

3DMark 2000

Remedy Entertainment's MAX-FX is used to test the DirectX performance of a system. It runs two specially coded games at low, medium and high resolutions. We ran the benchmark at 1,280 x 1,024 in 16bit colour, with each game set to loop three times. The 3DMark is calculated by adding the frames per second for each game together and multiplying the result by 12.

Quake III

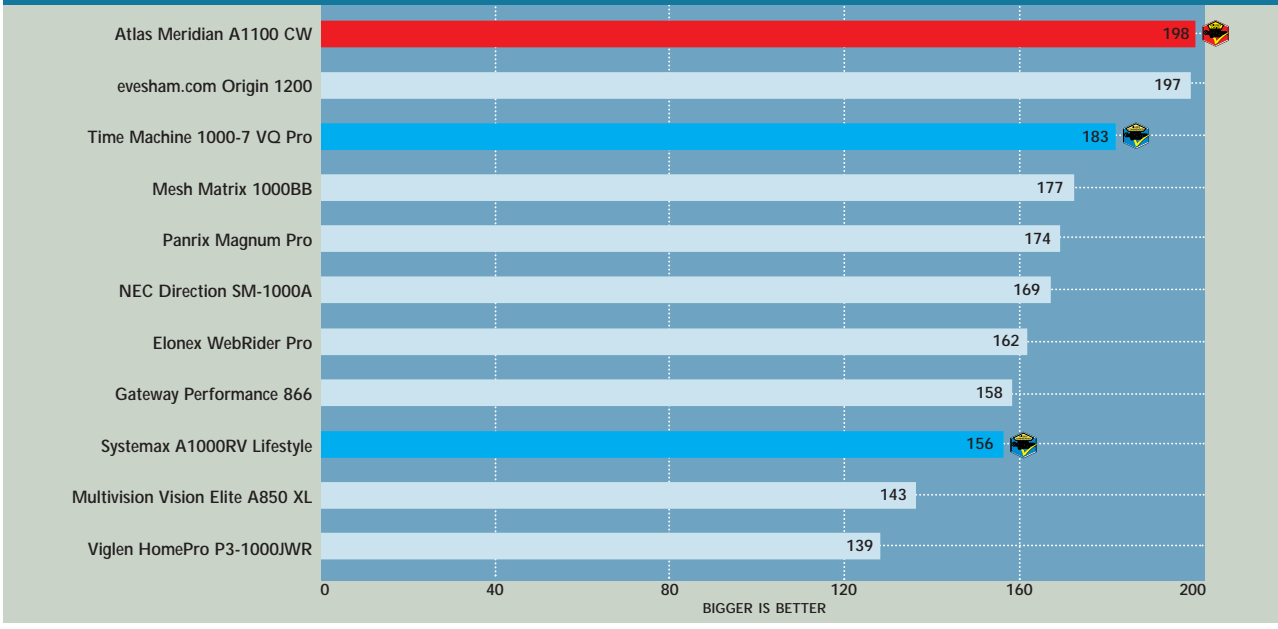
We tested each system's OpenGL performance with Quake III: Arena (1.11).

The settings were: video mode - 1,280 x 1,024, colour depth - 16bit, full screen, highest texture detail, texture quality - 16bit, texture filter - bilinear, lighting and lightmap.

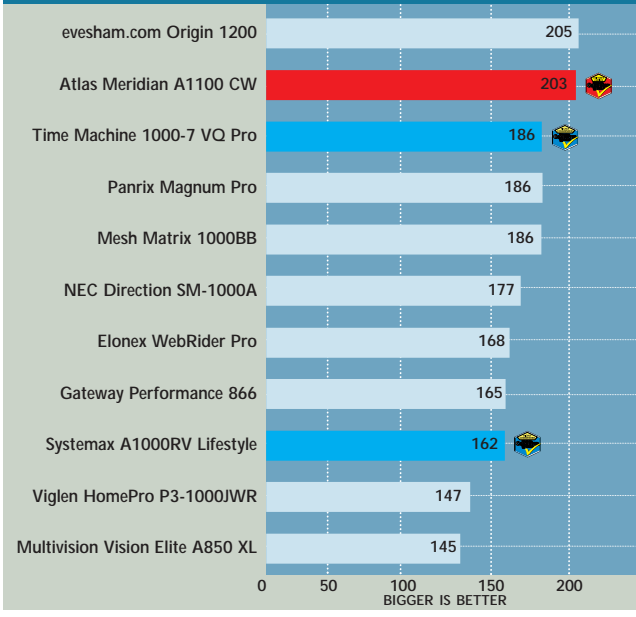
At command prompt we typed:
`timedemo 1`
`demo demo001`

This runs demo 1 and records the frames per second.

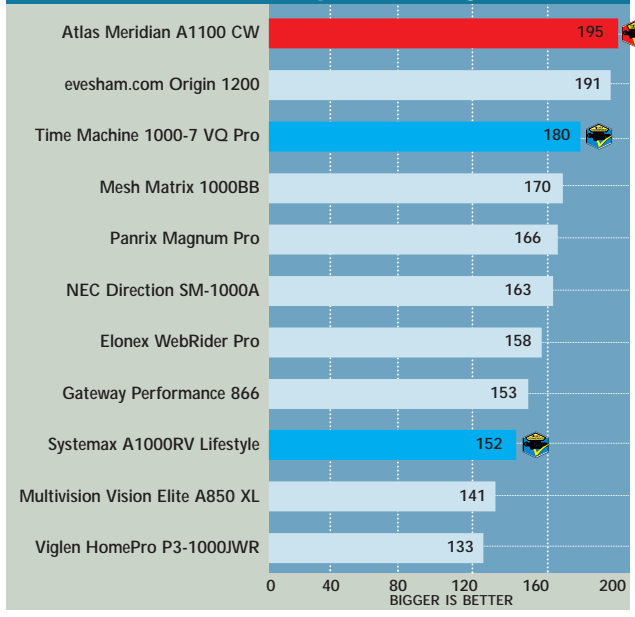
SYSmark 2000 overall



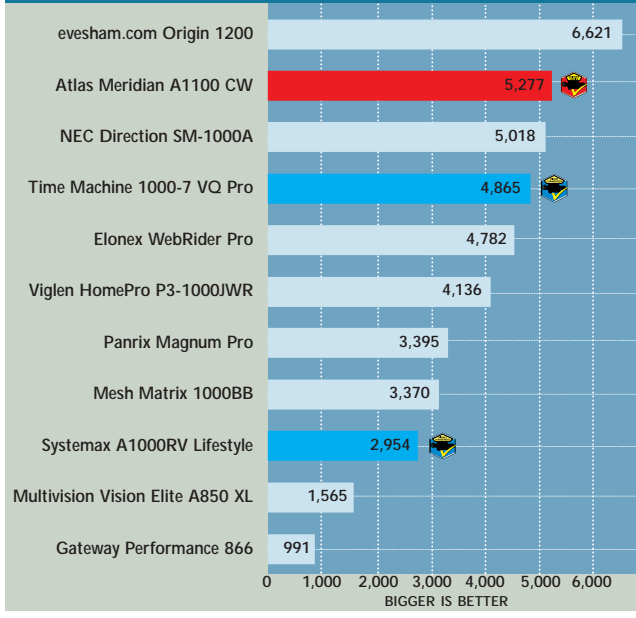
SYSmark 2000 Internet content creation



SYSmark 2000 office productivity



3DMark 2000 (1,280 x 1,024 at 16bit)



Quake III (fps) (1,280 x 1,024 at 16bit)

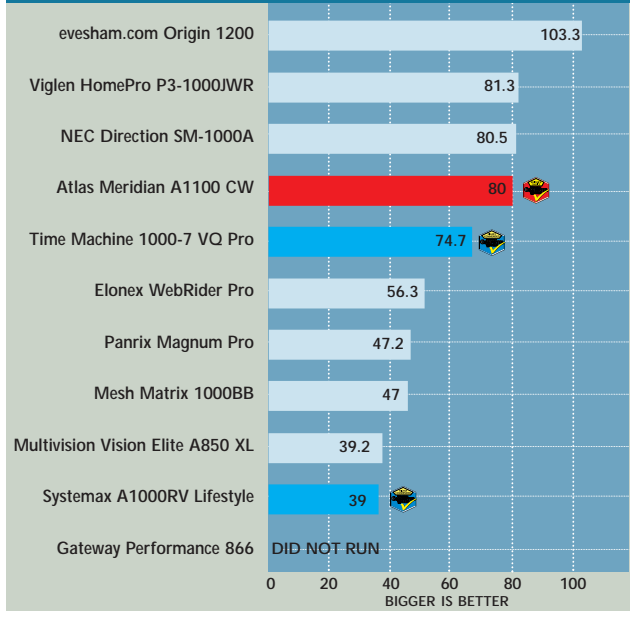











Table of features

| MANUFACTURER | ATLAS | ELONEX | EVESHAM.COM | GATEWAY |
|---|---|--|--|--|
| MODEL NAME | MERIDIAN A1100 CW | WEBRIDER PRO | ORIGIN 1200 | PERFORMANCE 866 |
| Price inc VAT (ex VAT) | £1,996.33 (£1,699) | £1,996.33 (£1,699) | £2,348.83 (£1,999) | £1,173.83 (£999) |
| Telephone | 07000 285 275 | 020 8452 4444 | 0800 038 0800 | 0800 552 000 |
| URL | www.atlasplc.com | www.elonex.co.uk | www.evesham.com | www.gateway.com/uk |
| HARDWARE SPECS | | | | |
| Processor | Athlon 1.1GHz (socket) | Pentium III 933MHz | Athlon 1.2GHz (socket) | Pentium III 866MHz |
| RAM/type | 128MB/PC133 | 256MB/PC133 | 256MB/PC133 | 128MB/PC133 |
| Occupied RAM slots/spare RAM slots | 1/2 | 1/2 | 2/1 | 1/3 |
| Max memory in this configuration | 1.1GB | 1.3GB | 768MB | 512MB |
| Maximum memory supported by motherboard | 1.5GB | 1.5GB | 1.5GB | 512MB |
| Hard disk (manufacturer and model) | IBM Deskstar | Maxtor 53073H6 | Maxtor 54098H8 | Western Digital |
| HD size/interface | 46.1GB/EIDE | 30.7GB/EIDE | 40.9GB/EIDE | 20.5GB |
| Storage drive model and manufacturer | Teac CD-W54E | Acer CRW-8432IA | Panasonic CW 7585 | Philips CDD 4801 |
| Size of storage drive media | 650MB | 650MB (one disc inc) | 650MB | 650MB (2xCD-R,1xCD-RW inc) |
| MOTHERBOARD COMPONENTS | | | | |
| Motherboard manufacturer | Asus | MSI | Chaintech | Intel |
| Model/chipset | A7V/VIA KT133 | MS 6309/VIA 694X | CT-7AJA/VIA KT133 | Feodora/815E |
| EXPANSION AND I/O | | | | |
| No of 3.5/5.25in bays | 4/3 | 4/3 | 2/3 | 4/2 |
| No of free 3.5/5.25in bays | 2/1 | 2/1 | 1/0 | 2/0 |
| No of PCI/ISA/shared/AMR slots | 4/0/1/0 | 4/0/1/1 | 4/0/1/1 | 4/0/1/0 |
| No of free PCI/ISA/shared/AMR slots | 2/0/1/0 | 2/0/1/0 | 3/0/1/0 | 3/0/0/0 |
| No of USB/serial/parallel/PS/2 | 4/2/1/2 | 2/2/1/2 | 2/2/1/2 | 4/1/1/2 |
| MULTIMEDIA | | | | |
| DVD manufacturer/model | Hitachi/GD-7500 | Acer 16X | Pioneer/DVD-115 | Panasonic/SR-8586 |
| DVD speed/interface | 12x/EIDE | 16x/EIDE | 16x/EIDE | 16x/EIDE |
| Sound card manufacturer | VideoLogic | Creative | Creative | Creative |
| Sound card model | SonicFury | SB Live! 1024 | SB Live! 1024 | SB PCI 128 |
| Graphics card manufacturer and model | Leadtek WinFast GeForce2 GTS | Hercules 3D Prophet II GTS | VisionTek nVidia GeForce2 Ultra | nVidia TNT2 M64 |
| Chipset | nVidia GeForce2 GTS | nVidia GeForce2 GTS | nVidia GeForce2 Ultra | nVidia TNT2 M64 |
| RAM/max RAM and type | 64MB/64MB DDR SGRAM | 32MB/32MB DDR SGRAM | 64MB/64MB DDR SDRAM | 32MB/32MB SDRAM |
| Monitor manufacturer/model | CTX PR960F | Iiyama Vision Master Pro 450 | Mitsubishi Diamond Plus 91 | Gateway EV700 |
| Monitor size/max viewable diagonal | 19in/18in | 19in/18in | 19in/18in | 17in/16in |
| Maximum flicker-free resolution | 1,600 x 1,200 at 85Hz | 1,600 x 1,200 at 85Hz | 1,600 x 1,200 at 75Hz | 1,024 x 768 at 85Hz |
| OTHER INFORMATION | | | | |
| Misc hardware | Logitech WingMan Force 3D joystick and extreme gamepad | Hauppauge WinTV tuner and remote Logitech QuickCam Web | | |
| Bundled software | MS Works 2000, upgrade for Office 2000 Pro, games bundle, Windows 98 SE | Windows Me | MS Works Suite 2000, Windows Me | MS Works Suite 2000, Windows Me |

|  |  |  |  |  |  |  |
|--|---|--|---|--|---|---|
| MESH | MULTIVISION | NEC | PANRIX | SYSTEMAX | TIME | VIGLEN |
| MATRIX 1000BB | VISION ELITE A850 XL | DIRECTION SM-1000A | MAGNUM PRO | A1000RV LIFESTYLE | TIME MACHINE 1000-7 VQ PRO | HOMEPRO P3-1000JWR |
| £1,526.33 (£1,299) | £1,173.82 (£999) | £1,526.33 (£1,299) | £2,344.13 (£1,995) | £1,761.33 (£1,499) | £1,526.33 (£1,299) | £1,940.50 (£1,651.49) |
| 020 8208 4706 | 0121 550 8000 | 0870 010 6322 | 0113 244 4958 | 08707 297 366 | 01282 777 555 | 020 8758 7000 |
| www.meshcomputers.com | www.multivision.co.uk | www.nec-online.co.uk | www.panrix.com | www.simply.co.uk | www.timecomputers.com | www.viglen.co.uk |
| Athlon 1GHz (socket) | Athlon 850MHz (socket) | Athlon 1GHz (socket) | Athlon 1GHz (socket) | Athlon 1GHz | Athlon 1GHz | Pentium III 1GHz |
| 128MB/PC133 | 128MB/PC100 | 128MB/PC133 | 256MB/PC133 | 128MB/PC133 | 128MB/PC133 | 128MB/PC133 |
| 1/2 | 1/2 | 1/1 | 1/2 | 1/2 | 1/2 | 1/2 |
| 1.1GB | 1.1GB | 640MB | 1.3GB | 1.1GB | 1.1GB | 512MB |
| 1.5GB | 1.5GB | 1GB | 1.5MB | 1.5GB | 1.5GB | 512MB |
| IBM Deskstar | Seagate Barracuda | Quantum Fireball | IBM Deskstar | Maxtor 53073H6 | Seagate Barracuda | Seagate Barracuda |
| 30.7GB/EIDE | 30.6GB/EIDE | 60GB/EIDE | 60GB/EIDE | 30.7GB/EIDE | 30.6GB/EIDE | 30.6GB/EIDE |
| Teac CD-W54E | Mirai CRD-BP1300P Burn-Proof | Sony CRX 140E | HP 9110i | lomega ZipCD | LG CED-8083B | Sony CRX140E |
| 650MB | 650MB | 650MB | 650MB | 650MB | 650MB | 650MB (1xCD-R, 1xCD-RW inc) |
| Asus | EPoX | MSI | Asus | Biostar | Asus | Viglen OEM (D815EEA) |
| A7V/VIA KT133 | EP-8KTA+/VIA KT133 | MS6340/VIA KT133 | A7V/VIA KT133 | M7VKB/VIA KT133 | A7V/VIA KT133 | Intel/815E |
| 3/3 | 3/4 | 5/2 | 4/3 | 3/3 | 4/3 | 4/2 |
| 1/1 | 1/2 | 3/0 | 2/1 | 1/1 | 2/1 | 2/0 |
| 4/0/1/0 | 5/0/1/0 | 2/0/1/0 | 4/0/1/0 | 4/0/1/1 | 4/0/1/0 | 5/0/0/0 |
| 1/0/1/0 | 3/0/1/0 | 0/0/1/0 | 2/0/1/0 | 1/0/1/1 | 2/0/1/0 | 3/0/0/0 |
| 5/2/1/2 | 2/2/1/2 | 3/2/1/1 | 5/2/1/2 | 2/2/1/2 | 5/2/1/2 | 2/1/1/2 |
| Pioneer/DVD-115 | Hitachi/GD-7000 | Pioneer/DVD-115 | AOpen/1640 Pro | Pioneer/DVD-105S | Pioneer/DVD-104S | Pioneer/DVD-115 |
| 16x/EIDE | 8x/EIDE | 16x/EIDE | 16x/EIDE | 16x/EIDE | 10x/EIDE | 16x/EIDE |
| Creative | Creative | Creative | VideoLogic | VideoLogic | Creative | Creative |
| SB Live! 1024 | SB Live! 1024 | SB Live! Value | SonicFury | SonicFury | SB Live! 1024 | SB Live! 1024 |
| ATI Radeon VIVO | Hercules 3D Prophet II MX | nVidia GeForce2 GTS | ATI Radeon VIVO | 3D Power Geforce2 MX | Hercules 3D Prophet II GTS | 3D Power Geforce2 GTS |
| ATI Radeon | nVidia GeForce2 MX | nVidia GeForce2 GTS | ATI Radeon | nVidia GeForce2 MX | nVidia GeForce2 GTS | nVidia GeForce2 GTS |
| 64MB/64MB DDR SDRAM | 32MB/32MB SDRAM | 32MB/32MB DDR SGRAM | 64MB/64MB DDR SDRAM | 32MB/32MB SDRAM | 32MB/32MB DDR SGRAM | 32MB/32MB DDR SGRAM |
| Mitsubishi Diamond Pro 720 | Hansol 710D | NEC VR19 | Mitsubishi Diamond Plus 91 | Mitsubishi Diamond Plus 91 | Samsung Samtron 95P Plus | Viglen badged flat panel Mitac 15RX TFT |
| 17in/16in | 17in/16in | 19in/18in | 19in/18in | 19in/18in | 19in/18in | 15in |
| 1,600 x 1,200 at 75Hz | 1,600 x 1,200 at 75Hz | 1,600 x 1,200 at 85Hz | 1,600 x 1,200 at 75Hz | 1,600 x 1,200 at 75Hz | 1,600 x 1,200 at 75Hz | 1,024 x 768 |
| ATI PCI TV Wonder Tuner | | Hauppage WinTV-USB, Logitech USB QuickCam Express, headset-mic, Logitech WingMan Extreme Digital 3D joystick | | Umax 2100U scanner, MS Sidewinder Gamepad Pro, ATI TV Wonder Tuner, Creative WebCam Go, Xerox Docuprint C8 colour inkjet printer & cable | Saitek R4 Force Feedback steering wheel & pedals, Saitek Cyborg 3D joystick, Agfa CL18 digital camera | Onboard Network Intel Pro/100VE, Saitek Cyborg Joystick |
| MS Works Suite 2000, Windows 98 SE | Lotus SmartSuite Millennium, Windows Me | MS Works Suite 2000, Flight Simulator 98, Windows Me | MS Works 2000, games bundle, Windows Me | Lotus SmartSuite Millennium, Systemax 6 Gamepack bundle, Me | MS Works 2000, Standard and Executive software packs, Windows 98 SE | MS Works Suite 2000, Windows Me |



Editor's Choice

With the specification pretty much left wide open, our previous award winners had free rein to put together a PC that they thought would make the ultimate Christmas bargain.

We say bargain because, like many people at this time of year, we are looking for something that represents excellent value for money – a factor we insisted upon in the original invitation sent out to all the suppliers.

When the systems arrived it was clear that each supplier had a different take on what would be their biggest selling Christmas PC. Price, for instance, was quite varied, ranging from £999 to a wallet-stretching £1,999 ex VAT. Of course, with this price variance came a wide choice of components, peripherals and software, together with differences in performance.

However, there were some obvious similarities. For example, every contender submitted a machine with both a CD-RW and a separate DVD-ROM drive, allowing the end user to back up data onto compact disc, either from the hard drive or direct from the DVD-ROM drive. In addition, it was interesting to see that most vendors had opted for an AMD Athlon processor to drive their machines, while nVidia did rather well on the graphics front.

So, by taking on board each of these features, weighing up the pros and cons, and relating them back to value for money, here's our opinion on which system really deserves the accolade of being the best of the best.

The winners

Running away with the best of the best **Editor's Choice** is Atlas with its **Meridian A1100 CW**. Featuring a beefy 1.1GHz Athlon CPU, 128MB of PC133 RAM and a GeForce2 GTS graphics card, the Atlas turned out to be one of the quickest PCs on test. Not only is it speedy, but all the components are of top quality. The 19in CTX monitor makes excellent use of Sony's FD Trinitron tube, while the VideoLogic SonicFury sound card and DigiTheatre LC surround sound speakers will please both music lovers and gamers alike. As for storage, the meaty 46.1GB hard drive will be more than enough for some time to come, and it makes use of one of the extra UltraDMA100 channels on the Asus motherboard. To top everything off, a Force Feedback joystick, gamepad and a selection of games are included to get you up and gaming on Christmas day. A three-year on-site warranty also comes as standard.

Now if you're one of those people who can remember the excitement that a massive load of presents piled under the Christmas tree can bring, then the **Highly Commended Systemax A1000RV Lifestyle** and its plethora of peripherals could bring back some happy memories. For the decent price of £1,499 the Systemax comes complete with a Umax scanner, Microsoft gamepad, Creative's WebCam Go, a Xerox colour inkjet printer and an ATI TV Tuner card if watching television on the quality 19in Mitsubishi monitor takes your fancy. With the same set-up as the

Atlas, audio comes courtesy of VideoLogic, while processing power comes from the ever-popular 1GHz AMD Athlon. Performance is not quite as good as that of the Atlas, largely due to the slower GeForce2 MX card – but this is not what the Champion is about. It is an ideal home entertainment PC that should appeal to the new user or first-time buyer – a good Christmas buy, but expensive on the wrapping paper.

Deciding upon which system was to get our final **Highly Commended** was the trickiest, with the Time Machine 1000-7VQ Pro, Mesh Matrix 1000BB and NEC Direction SM-1000A making strong bids for the trophy. All come with 1GHz Athlon processors and are competitively priced at £1,299. But, in the end, the Time just clinched it. While the Mesh comes with a beefy 64MB ATI Radeon graphics card, it doesn't quite fulfil our value for money criteria as it comes with a smaller 17in monitor and has a limited number of peripherals. Performance was a little down, too.

Even though the NEC has a good complimentary bundle and has twice the hard-drive capacity of the other two, it is let down by limited expansion possibilities with its micro ATX motherboard. However, the **Time Machine 1000-7VQ Pro** puts in a fine showing in the performance ratings, and offers a generous bundle that includes a Force Feedback joystick, steering wheel with pedals, and a digital camera, albeit a low-resolution one. A decent 19in monitor and nVidia's GeForce2 GTS graphics card top off a respectable buy.



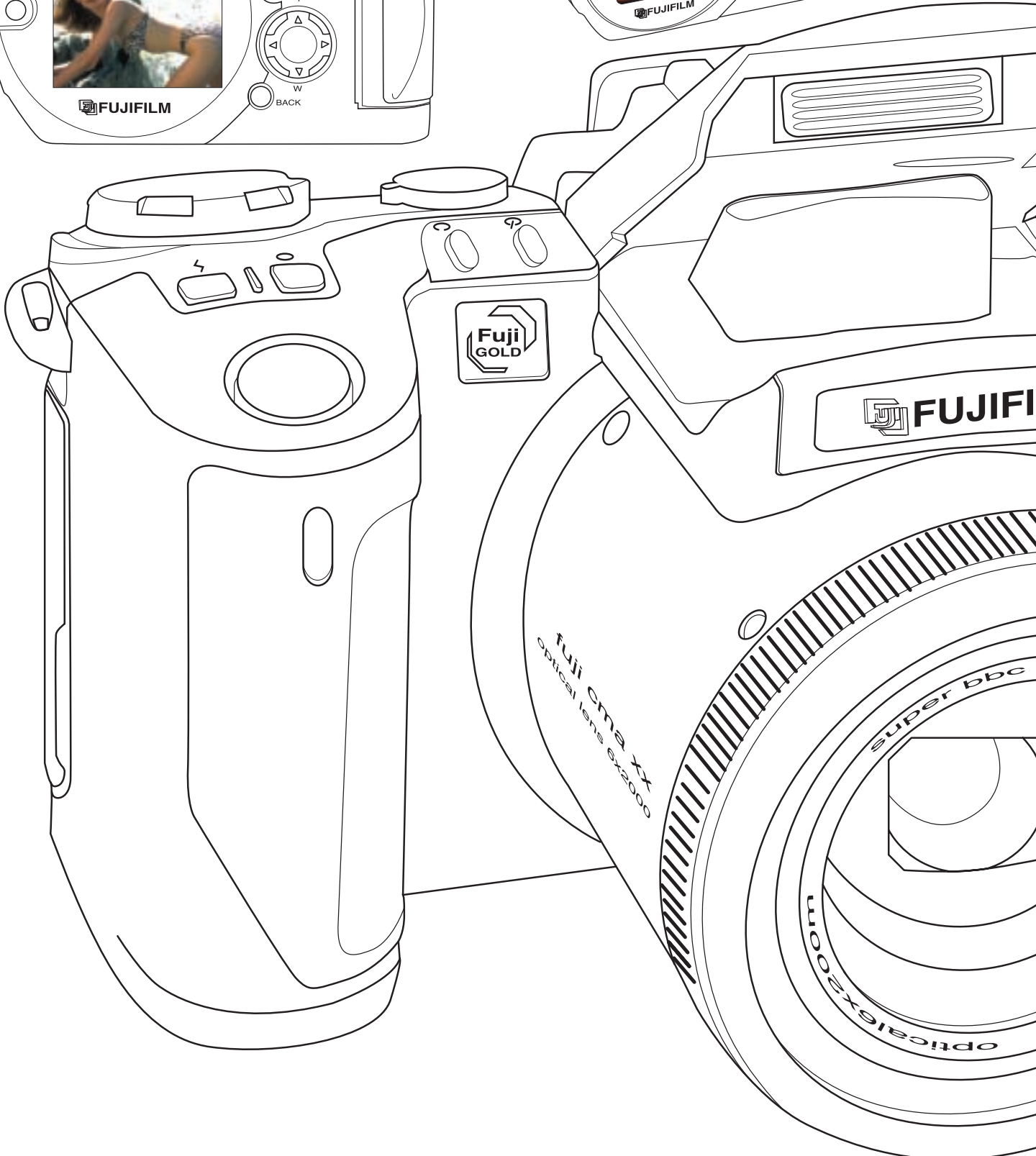
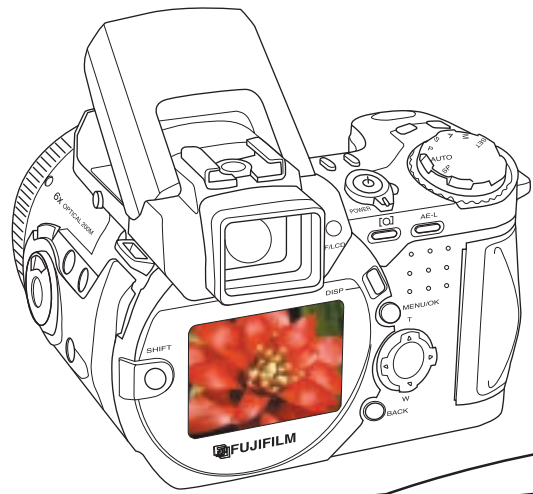
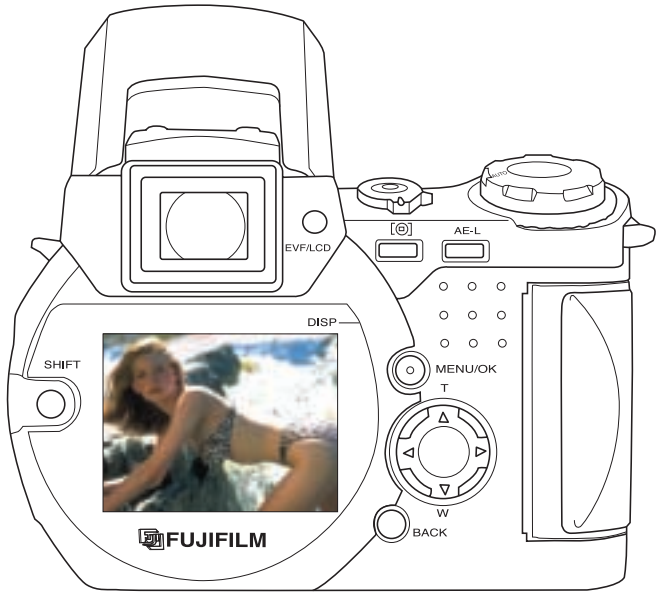
The Atlas turned out to be one of the quickest on test



The Systemax A1000RV Lifestyle comes with a plethora of peripherals



The Time Machine performs well and includes a generous bundle



Say cheese!

To complement this month's *pcw* expert on digital cameras we've put 14 snappers – from budget to fully featured – to the test

Digital cameras have certainly come a long way in a remarkably short time. In just a few years we've seen the quality of their images increase over ten-fold. Today's top of the range models boast 3.3 megapixel CCDs, which are easily capable of making great looking A4 inkjet prints and really giving film cameras a run for their money in terms of photographic control.

But let's not forget the unique qualities only a digital camera can offer. The pictures are ready to view in an instant, and since they're already in digital format, there's no need to bother with all that tedious scanning to get them into a PC for retouching, emailing or uploading to a website.

With re-usable memory cards, you'll never have to worry about buying and developing film again, not to mention finishing a roll before seeing your pictures. Virtually all digital cameras also feature video outputs, allowing you to make an instant slide show on your TV. Many models can even grab short clips of audio and video, perfect for capturing a multimedia moment. They're truly some of the most versatile devices on the market today.

Best of all, there's never been a better time to buy, with highly desirable compact models available, or those packed with every feature a photographic enthusiast desires. While traditionally more expensive than their film-based counterparts, you may be surprised to learn of budget digital cameras that are low-cost in every sense of the term. With this in mind, we've

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• *Digital cameras tested and reviewed by Gordon Laing*

rounded up no fewer than 14 digital cameras, representing the entire market. We've got eight of the latest fully featured high-quality models, and four totally irresistible pocket-sized beauties.

To round off the test, we looked at a pair of budget models just to see if it's possible to buy a usable digital camera for as little as £100. Also in this issue is our *pcw* expert on digital cameras, explaining their past, present and future, along with tips on how to get the best out of this new technology – see page 241.

ILLUSTRATION Simon Brown

Agfa ePhoto CL18

BUDGET



CL18 is going to be a pretty basic model. With a maximum resolution of only 640 x 480 pixels, the CL18's CMOS sensor only musters one-third of a megapixel. Considering most colour inkjet printers like being fed around 200 pixels per printed inch, you're only looking at making photos up to 4 x 3in at best before losing detail. Then again, while VGA resolution is very low for photographic prints, it's huge for online use. Most pictures on websites

TO ACHIEVE POSTCARD-SIZED prints, you're looking at a digital camera with a resolution of at least one megapixel, and these models start at over £200. But there are several models available for as little as £100 ex VAT.

The best representative of rock-bottom digital cameras is Agfa's ePhoto CL18, which costs £118, around five to six times less than the fully featured models elsewhere in this group test.

Clearly for this kind of money, the

measure no more than 200 pixels wide, which makes a VGA camera more than sufficient – so long as you're not cropping in too much. It's also an ideal image size for emailing pictures or viewing them on a TV screen.

The 640 x 480 resolution is offered at two levels of jpeg compression, and the CMOS sensor is rated at 200 ISO sensitivity. There are no removable cards, with the CL18 instead employing 2MB of built-in memory, squeezing in

16 pictures at best quality, or 32 at the lower-quality setting.

There's no colour screen, with composition relying on the optical viewfinder. Power comes via a pair of alkaline AA batteries, although you're advised to buy a charger and a set of NiMHs. The CL18 has a USB interface, so you that can also draw power from your PC.

Weighing 117g without battery, the CL18 is a compact, but basic camera. VGA resolution is sufficient for online or TV use, but doesn't cut the mustard for anything but the smallest prints. You may be better off with the flexibility of a model designed as a VGA webcam featuring still capabilities.

DETAILS

PRICE £118 (£100.43 ex VAT)

CONTACT 020 8231 4903

www.agfa.co.uk

PROS One of the cheapest digital cameras on the market; USB interface

CONS Low 640 x 480 0.3megapixel resolution; no manual control

OVERALL Undeniably cheap, but a dedicated webcam may prove more flexible

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★

★

★★

★★

Epson PhotoPC 650

BUDGET



Compact Flash card, and though there's no CF slot to accommodate the IBM Microdrive, it's still an impressive capacity. While 8MB isn't much for more upmarket cameras, the lower-resolution 650 considers it almost palatial. You'll get around 30 best-quality jpegs, 47 medium quality and 88 at the lower VGA resolution. Composition is with the optical viewfinder or 1.8in screen.

Unsurprisingly at this price there's no zoom lens, with the 650 instead

employing fixed focal length optics equivalent to 33mm on a 35mm camera; the actual specification is 6mm, f2.0, while the closest macro focusing distance is 15cm.

Exposure is almost entirely automatic, without the option to manually adjust compensation or white balance. The camera, however, has a number of shutter speeds, from 1/4 to 1/750 second, along with four apertures up to f11. You can manually force the flash on, off or

THE SECOND OF our budget digital cameras costs £225, and features a 1.09megapixel CCD. With a maximum resolution of 1,152 x 864 pixels, you'll be able to produce colour inkjet prints approaching 5 x 7in before you start losing detail. This resolution is offered at two levels of jpeg compression and, impressively for a camera of this price, also in an uncompressed mode. A lower 640 x 480 pixel mode is also available.

Epson supplies the 650 with an 8MB

for red-eye reduction. There's no movie or audio capture, but you can connect the 650 to your TV for a slide show.

The 650 weighs 315g without batteries. It consumes four AAs, and Epson supplies a set to get you started, but we'd recommend investing in a charger and a set of NiMHs.

Sadly there's no USB interface, with the camera instead relying on an old slow serial connection. Fortunately the 650's images are sufficiently small for this not to be too big an issue.

If you can afford £350, then go for the 2.1megapixel Kodak DC3800 and make bigger prints. Otherwise, Epson's 650 is a great entry-level digital camera.

DETAILS

PRICE £225 (£191.49 ex VAT)

CONTACT Epson 0800 220 546

www.epson.co.uk

PROS Plenty of capacity for pictures; cheap for a digital camera

CONS No USB interface; virtually no manual control

OVERALL The cheapest digicam worth having, but £350 gets you the Kodak DC3800

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★★

★★

★★★

★★★



Canon Digital Ixus

COMPACT



x 1,200 pixel images. The Digital Ixus offers two levels of jpeg compression and a lower 640 x 480 pixel mode, but no uncompressed tiffs. Like other Canon models, the best-quality jpegs employ relatively mild compression. Canon supplies an 8MB Compact Flash card, but the Type I CF slot won't accommodate the IBM Microdrive.

The supplied lithium-ion battery fully recharges in around 120 minutes and is good for around 85

DESPITE NOW BEING (only just) the oldest of the four mini cameras in this section, Canon's Digital Ixus remains the smallest at 87 x 57 x 27mm, and weighs a mere 190g without its battery.

Canon has squeezed in a 2x optical zoom lens, equivalent in focal length to 35-70mm on a 35mm camera; the actual specification is 5.4-10.8mm, f2.8-4.0 and the closest macro focusing distance is 10cm.

A 2.1megapixel CCD produces 1,600

shots using the 1.5in screen, or more with the optical viewfinder. There's no LCD status panel, so you have to use the main screen to check battery life.

The Digital Ixus is almost entirely automatic. You can, however, choose a black and white mode, set the white balance and adjust exposure compensation. The flash can also be forced on/off, reduce red-eye, or slow-synchro to complement long exposures up to one second. There's also TV

output, but no video capture mode. Finally, a neat stitch-assist mode helps you align multiple frames for later joining together in software for a nice panoramic effect.

Connection is across USB only, and Canon's supplied ImageBrowser software lets you browse, manage and download images. Picture quality is pretty good, but there's a little electronic noise on smooth coloured graduations like blue skies. Then again, we produced fairly respectable 10 x 8in prints, and postcard-sized output looked great. Anyone after a good-quality snapper in the smallest possible case won't be disappointed.

DETAILS

PRICE £529 (£450.21 ex VAT)
CONTACT Canon 0121 666 6262
www.canon.co.uk

PROS Tiny, gorgeous, and more than adequate for snappy situations

CONS Not 3.3megapixel; slight noise on images; must use screen to check status

OVERALL Highly desirable, but Kodak's 3800 is cheaper and Sony's P1 is better quality

| | |
|------------------------|------|
| FEATURES | ★★★★ |
| PERFORMANCE | ★★★★ |
| VALUE FOR MONEY | ★★★★ |
| OVERALL RATING | ★★★★ |



Fujifilm FinePix 40i

COMPACT



provides 150 minutes of music playback.

Yes, the 40i also uniquely boasts MP3 audio playback, and Fujifilm supplies it with a pair of earphones and remote control.

The 40i's lens is fixed at 8.3mm, equivalent to a 36mm lens on a 35mm camera; it can focus as close as 6cm. The fixed lens allows the 40i to be ready for action in just over a second.

Exposure compensation is offered between +/-1.5EV in 1/3 EV steps,

and the flash can be forced on, off, set for red-eye reduction or slow-synchro with shutter speeds down to 1/4 second. The movie mode captures 320 x 240 video at 10fps with audio; clips can be up to 80 seconds each.

Fujifilm supplies an 8MB SmartMedia card, and the highest resolution images can be saved at three levels of compression, along with 1,280 x 960 and 640 x 480 pixel modes – no uncompressed tiffs though.

THE FINEPIX 40i houses Fujifilm's proprietary Super CCD imaging technology, claimed to deliver 4.3megapixel resolution (see *pcwexpert*).

The 40i is the same width and thickness as the Digital Ixus, but about 14mm taller. It's lighter at only 210g including its pair of rechargeable 1,600mAh NiMH AA batteries, good for around 80 shots with the 1.8in LCD; the display can also superimpose handy framing guides. Or a fresh charge

The camera certainly outputs large 4.3megapixel, 2,400 x 1,800 images, but the fact remains that it started with 2.4megapixels. The 4.3megapixel files also measure around 12MB, which means Fujifilm has to increase the compression to deliver the 1,700KB jpegs on the 40i's best-quality mode.

In our tests, most of the 40i's images suffered from higher than average electronic noise, with speckling in smooth graduations and shadows. In our optical tests, it resolved between 2.1 and 3.3megapixel models.

The 40i is a quick and small snappy camera and uniquely doubles as a personal stereo.

DETAILS

PRICE £549 (£467.23 ex VAT)
CONTACT Fujifilm: 020 7465 5745
www.fujifilm.co.uk/di

PROS Small; light; very quick start-up and shutdown; can play MP3 audio

CONS No optical zoom; MP3 needs more memory; above average electronic noise

OVERALL Cute and versatile, but also consider the other three compacts tested here

| | |
|------------------------|------|
| FEATURES | ★★★★ |
| PERFORMANCE | ★★★★ |
| VALUE FOR MONEY | ★★★★ |
| OVERALL RATING | ★★★★ |



Kodak DC3800

COMPACT



THE COMPACT DIGITAL camera market is hotting up. Others on test here cost between £529 and £699; the DC3800 is just £349.

It's certainly compact, measuring 94 x 61 x 33mm and weighing just 165g without batteries. Like the Fujifilm 40i, the DC3800's lens is a fixed focal length, equivalent to 33mm on a 35mm camera; the actual specification is 6.9mm, f2.8, and the closest macro distance is 20cm. Not having to pop out or retract its lens

allows the DC3800 to be ready for action quickly.

Behind the lens lies a 2.1megapixel CCD, although unlike the 1,600 x 1,200 resolution of other models, Kodak has once again opted for one of its own 3:2 aspect ratio chips, delivering 1,792 x 1,184 pixel images. Best-quality jpegs measure around 500KB, and Kodak supplies the DC3800 with an 8MB Compact Flash card. Interestingly, the camera itself has no direct connection to a PC, with Kodak instead including a separate USB Compact Flash reader with the package.

Kodak is certainly playing the ease-of-use card, with the DC3800 offering the bare minimum of controls and options. A dial selects either record, playback, macro or setup modes, with the latter essentially offering just three quality settings, and the choice of activating burst mode or quick view.

Unusually, there's no exposure compensation or white-balance options,

although in our tests the images came out remarkably well. There are no tiff, audio, movie or manual exposure modes either, and rather infuriatingly the video output is NTSC only, requiring a multi-standard TV. You can at least manually force the flash on, off, or set for red-eye.

The DC3800 uses a pair of AA batteries which come with the package. The DC3800, however, consumes these at an alarming rate, forcing you to invest in a recharger and a set of NiMHs – a fresh charge should last about one hour.

Eliminating almost all control, the DC3800 will appeal to snappers who want a small, simple, 2.1megapixel camera at a low, low price.

DETAILS

PRICE £349.99 (£297.86 ex VAT)

CONTACT Kodak: 0870 243 0270

www.kodak.com/go/dc3800

PROS Relatively cheap and compact 2.1megapixel camera

CONS The barest of controls, even for a basic compact; battery-hungry

OVERALL Point-and-shoot snappers on a budget will love the DC3800

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★★

★★★

★★★★

★★★★

Sony Cyber-shot DSC-P1

COMPACT



SONY'S NEW P1 IS slightly longer and thicker than our other three compacts, measuring 113 x 54 x 44mm and weighing 210g without battery, but it thrashes them in features and quality.

Remarkably, Sony has squeezed a 3x optical zoom into the P1, equivalent to 39-117mm on a 35mm camera. When powered down, it retracts entirely.

The P1 boasts nothing less than 3.3megapixels. That's 2,048 x 1,536 pixels, with 1,600 x 1,200, 1,280 x 1,024

and 640 x 480 modes also offered. There's an uncompressed tiff mode, along with mono gifs for cleanly capturing documents. Best-quality jpegs weigh in around 1,300KB, and Sony only supplies a measly 8MB Memory Stick.

Composition is with an optical viewfinder, or crisp 1.5in screen, which can smoothly zoom in up to five times during playback. The screen doesn't quite show 100 per cent coverage during capture though, and the

displays only indicate number of pictures taken, as opposed to number remaining.

In its use and features, the P1 feels like a shrunk-down S70, although it's sadly missing aperture and shutter priority modes. Fans of night-shots must rely on the two extra-sensitive Twilight modes and a longest exposure of two seconds. There's compensation from +/-2EV in 1/3 steps though, and you can alter flash brightness.

The movie mode can capture up to

15 seconds of video at 320 x 240 or 60 seconds at 160 x 120, both at 15fps with mono audio; there's a built-in speaker too. The files are stored in MPEG-1 format and can fill a TV screen.

Unique to the P1 is a Clip Motion mode that can take up to 10 160 x 120 pixel images, then save them as an animated gif for online use. Rounding off the package is one of Sony's InfoLithium batteries, good for 90 minutes and indicating precisely how many minutes are remaining.

For £699 you could buy the Sony S70, but with great features in such a small case, the P1 will win many friends.

DETAILS

PRICE approx £699

(£594.89 ex VAT)

CONTACT Sony 0990 111 999

www.sony.co.uk

PROS Smallest 3.3megapixel/3x zoom camera; InfoLithium battery; great features

CONS 8MB memory is half the standard for 3.3 cameras; relatively expensive

OVERALL If you can live without manual control, this is a superb 3.3megapixel model

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★★★★★

★★★★

★★★★

★★★★

★★★★

★★★★

★★★★

★★★★

Canon PowerShot G1

FULLY FEATURED



CANON'S BACK and the new PowerShot G1 looks set to take no prisoners.

The G1 is a 3.3megapixel camera, supporting 2,048 x 1,536, 1,024 x 768 and 640 x 480 pixel modes. Our best-quality jpegs widely ranged from 800 to 1,800KB, and Canon supplies a 16MB Compact Flash card as standard; the CF slot welcomes the IBM Microdrive.

Rather than a tiff mode, the G1 employs Canon's proprietary raw format, also used by the Pro70 and

D-30. This literally takes the raw CCD information untouched by sharpening or white balancing, and losslessly compresses it to around 3MB – a lot more manageable than 9MB uncompressed tiffs. Canon supplies a TWIN driver to acquire and post-process raw files. The G1 also offers a great 50 ISO mode, which, while requiring twice as much light as standard 100 ISO, significantly reduces noise on images.

Joining the optical viewfinder is a flip-out 1.8in screen that can be twisted around for those tricky shots; during playback you can zoom in up to five times. The PowerShot also features a movie mode, recording 30-second 320 x 240 clips at 15fps with sound. The LCD information panel is comprehensive.

The 3x optical zoom is equivalent to 34-102mm on a 35mm camera. Canon throws in a tiny remote control and offers optional close-up, teleconverter

and wide-angle adaptors. Focusing can be set to single or continuous.

There's aperture and shutter priority, manual and auto control, with 40 shutter speeds from eight seconds to 1/1000, and 13 aperture settings; compensation is offered from +/-2EV in 1/3 steps, noise reduction kicks in below 1.3 seconds, and there's also a bracketing option. Along with the usual flash options is a full TTL hotshoe for external Canon Speedlites.

Weighing 470g with its lithium battery, the G1 is comparable with its direct competitor, the Nikon 990. The G1 lacks only a bulb and decent macro mode, but the 990 may have been toppled.

DETAILS

PRICE £799 (€680 ex VAT)
CONTACT Canon: 0121 666 6262
www.canon.co.uk



PROS Excellent control and quality; 50 ISO and raw modes; Microdrive compatibility
CONS Relatively modest macro; no bulb setting and slowish start-up time
OVERALL Arguably the best 3.3megapixel camera to date

| | |
|------------------------|------|
| FEATURES | ★★★★ |
| PERFORMANCE | ★★★★ |
| VALUE FOR MONEY | ★★★★ |
| OVERALL RATING | ★★★★ |

Epson PhotoPC 3000Z

FULLY FEATURED



EPSON'S PHOTOPC 3000Z is a fairly chunky 3.3megapixel camera measuring 108 x 89 x 65mm and weighing 368g without batteries. It consumes four AAs, and Epson supplies a set of NiMHs and a charger that refreshes overnight.

The 3000Z has a HyPict mode that takes the standard resolution of 2,048 x 1,536 and interpolates it to 2,544 x 1,904 pixels. It won't reveal detail that wasn't captured in the first place, but is designed to smooth edges in big

enlargements. But in our tests we didn't notice much difference and recommend interpolating images inside your PC.

The 3000Z comes with a 16MB Compact Flash card, but is not certified for use with IBM's Microdrive. Epson uses strict compression, with best-quality 2,048 x 1,536 jpegs measuring around 800KB each. There's also an uncompressed 9MB tiff mode, along with 640 x 480 and cropped 2,048 x 768 panoramic settings.

There's fine control over the 3x optical zoom lens, equivalent to 34-102mm on a 35mm film camera. Composition is with the optical viewfinder or 1.8in screen, which can zoom in two times during playback.

Flash options are good, with an external hotshoe and rear-curtain mode which fires the flash at the end of a long exposure. Aperture priority offers six steps from f2.0 to f8.0, while 42 shutter speeds between eight seconds and

1/750 are available in fully manual. There's also a neat time-lapse function automatically snapping at intervals between 10 seconds or 24 hours. Exposure compensation is available from +/-2EV in 1/3 or fine 1/5 EV steps.

The movie mode can capture up to 25 seconds of 320 x 240 video with mono audio, and play back full-screen on your TV. You can also record descriptive audio clips with each picture and there's a built-in speaker. The USB connection also lets you remotely control and configure the camera using your PC.

There's slightly high compression, but images still look good. Processing tiffs is relatively slow though. A good camera.

DETAILS

PRICE £799 (€680 ex VAT)
CONTACT Epson 0800 220 546
www.epson.co.uk

PROS Good quality; PC remote control of camera; time-lapse function
CONS HyPict appears to be a white elephant; slight over-compression
OVERALL Another good 3.3megapixel camera, but beaten by others

| | |
|------------------------|------|
| FEATURES | ★★★★ |
| PERFORMANCE | ★★★★ |
| VALUE FOR MONEY | ★★★★ |
| OVERALL RATING | ★★★★ |



Fujifilm FinePix 4900Zoom

FULLY FEATURED



camera, the 4900's lens is long; the actual specification is 7.8-46.8mm, f2.8-3.1, but the closest macro distance is a slightly average 10cm. A motor-assisted manual focus ring is offered. There's a relatively large 2in display for composition or a camcorder-style electronic viewfinder.

The 4900 employs one of Fujifilm's 2.4megapixel Super CCDs, which, with scaling, outputs 4.3megapixel, 2,400 x 1,800

SOME PEOPLE WILL instantly love the new FinePix 4900Zoom. Packed with features, buttons and gadgets, there's certainly plenty to play with. At 110 x 79 x 94mm, it's not pocketable, nor is it the lightest at 410g excluding its rechargeable lithium battery (approximately 110 minutes use), but the grip is comfortable to hold and the lens barrel boasts a massive 6x optical zoom, which zips out when powered up.

Equivalent to 35-210mm on a 35mm

jpeg settings and an uncompressed tiff mode, although at the highest '4.3megapixel' resolution, this produces 12MB files. Best-quality jpegs measure around 1,600KB, and Fujifilm supplies a 16MB SmartMedia card.

Fujifilm rates the standard sensitivity of Super CCD at 200 ISO, compared to 100 ISO of the competition. Cunningly, the 4900 has a new 125 ISO mode, which visibly reduced the noise on our Super CCD images.

Shutter priority offers 36 speeds from three to 1/2000 seconds, while aperture priority provides 14 different settings; compensation is offered between +/-2EV in 1/3 steps and there's also exposure bracketing. The manually popped-up flash can be forced on, off, set to red-eye reduction or slow-synchro; there's also a hotshoe for an external unit. Movie mode captures up to 160 seconds (memory permitting) of 320 x 240 video at 10fps without sound.

With its low-noise mode, the 4900 boasts the best images we've yet seen from Super CCD, but no better than most 3.3megapixel cameras. The 4900 is a good enthusiast's camera.

DETAILS

PRICE £799 (£680 ex VAT)

CONTACT Fujifilm: 020 7465 5745

www.fujifilm.co.uk/di

PROS Huge optical zoom; low-noise 125 ISO mode improves Super CCD output

CONS No sound; relatively modest macro and short long-exposure

OVERALL Great enthusiast's camera at a decent price, but check out the Canon G1

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★★★★

★★★★

★★★★

★★★★

Kodak DC4800

FULLY FEATURED



ratio. Best-quality jpegs averaged around 600KB, indicating relatively high compression. Kodak supplies a 16MB Compact Flash card, although the CF slot is not compatible with the IBM Microdrive.

The DC4800 features a 3x optical zoom lens, equivalent to 28-84mm on a 35mm film camera. But the widest zoom setting is 28mm, which is wider than the 32 to 40mm of most digital cameras.

Composition is with the optical viewfinder or 1.8in screen, although the 3:2 image aspect ratio results in a thin black bar running across the top; in playback mode you can zoom in two or four times. The flash can be forced on or off, left to auto or set to red-eye reduction; there's also a sync to an external flash gun.

The DC4800 is relatively compact, and weighs 320g without its lithium-ion battery, which charges in four hours. Connection is via USB, after which the

WHILE MOST 3.3megapixel cameras use Sony's CCD, Kodak has opted for one of its own chips for the DC4800. This chip delivers wide 3:2 aspect ratio 2,160 x 1,440 images, matching the shape of 35mm film.

The maximum 3.1megapixel resolution of the DC4800 is available at two levels of jpeg compression and in an uncompressed tiff mode; there are also lower 1,800 x 1,200, 1,536 x 1,024 and 1,080 x 720 modes, all in the 3:2 aspect

camera's memory is mounted as a removable drive in My Computer. There's also a video output to your TV, but no movie or audio capture modes.

Control is very simple, with a dial selecting auto, playback, setup and three aperture priority settings. Another dial directly adjusts exposure compensation from +/-2EV, albeit in relatively coarse 0.5 steps. You can manually choose 19 shutter speeds from 0.5 to 1/1000 second or from 0.7 to 16 seconds in long exposure mode.

Images suffer slightly from over-compression, but are fine for most occasions. A good camera, but other models beat it overall.

DETAILS

PRICE £699.99 (£594.89 ex VAT)

CONTACT Kodak: 0870 243 0270

www.kodak.com/go/dc4800

PROS Aspect ratio that matches 35mm and a wide 28mm lens setting

CONS Compression a little high; no movie mode; doesn't take IBM Microdrive

OVERALL Good overall camera, but the Nikon 880 is better for the money

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★★★★

★★★★

★★★★

★★★★

Nikon CoolPix 880

FULLY FEATURED



the highest 2,048 x 1,536 resolution is also available as an uncompressed 9MB tiff. Nikon supplies a 16MB Compact Flash card, but the slot is not IBM Microdrive compatible. Best-quality jpegs measure around 1MB.

Unlike the 3x of its competition, the 880 is fitted with a 2.5x optical zoom, equivalent to 38-95mm on a 35mm camera; and the macro focuses as close as 4cm. There are also five optional converter lenses

and a slide-copying adaptor. You have the choice of an optical viewfinder, or the 1.8in screen for composition; the latter can zoom up to four times on images during playback, and even display a tonal histogram.

The CoolPix 880 features essentially the same electronics as the 990 model, so you get burst capture modes, four types of metering, Nikon's Best Shot Selector (a boon in shaky situations), and excellent focusing options.

NIKON'S LATEST IS a light and compact 3.3megapixel model. When powered down, the lens retracts to the same depth as the comfortable grip, which makes it more pocketable than Sony's S70 or Olympus' 3030.

The 880 uses a rechargeable lithium battery, good for around 90 minutes, although it'll also take disposable 2CR5 batteries, lasting 110 minutes.

Three resolutions are offered, each at three levels of jpeg compression, while

There are 14 shutter speeds in manual from eight secs to 1/1000 and, like the 900, a Bulb mode up to 60 seconds with an optional USB cable release. The aperture priority has only two settings, but they do deliver small or large depth of fields respectively. Compensation is from +/-2EV in 1/3 EV steps.

The flash can be forced on, off, set to red-eye reduction or slow synchro, but there's no sync to an external unit. Movie mode captures 320 x 240 at 15fps, but without sound.

Finally there are 11 'scene' modes and a neat quick-review facility. Optical quality is excellent, which makes the CoolPix 880 a superb all-rounder.

DETAILS

PRICE £699 (£594.89 ex VAT)
CONTACT Nikon 0800 230 220
www.nikon.co.uk



PROS Low price; light; compact; great manual and automatic controls

CONS Only two aperture settings; no audio; not Microdrive compatible

OVERALL One of the best all-round 3.3megapixel cameras

| | |
|-----------------|------|
| FEATURES | ★★★★ |
| PERFORMANCE | ★★★★ |
| VALUE FOR MONEY | ★★★★ |
| OVERALL RATING | ★★★★ |

Nikon CoolPix 990

FULLY FEATURED



takes about 12 hours to top them up.

Along with the top 2,048 x 1,536 resolution, there are lower 1,024 x 768 and 640 x 480 settings, and the choice of three levels of compression – there's also an uncompressed 9MB tiff mode. Best-quality 2,048 x 1,536 jpegs measure around 1MB, and Nikon supplies a 16MB Compact Flash card; but the CF slot is incompatible with the IBM Microdrive.

The 990's optics are superb. There's fine adjustment of the 3x optical zoom, equivalent to 38-115mm on a 35mm camera. Macro mode is unrivalled at an amazing 2cm. Composition is via an optical viewfinder or with the 1.8in screen which can zoom in up to four times and even display a tonal histogram.

Exposure control is comprehensive, with 10 aperture settings, 14 shutter speeds from eight seconds to 1/1000, compensation from +/- 2EV in 1/3 stops, and even a bulb setting up to

NIKON'S 3.3MEGAPIXEL CoolPix 990 exudes quality and it's the most comfortable camera to use. The 990 is built in two halves, with the optical section smoothly rotating through 270 degrees – great for self-portraits.

Such build quality comes at a physical price however, with the 990 measuring 149 x 79 x 38mm and weighing 370g without batteries. Nikon supplies four AA NiMHs good for 90 minutes' solid use. The supplied charger

60 seconds using an optional USB cable release. You've got the choice of auto, manual, aperture or shutter priority modes, three types of metering and Nikon's effective Best Shot Selector.

The built-in flash can be forced on, off, reduce red-eye, slow-synch or fill-in, and there's a terminal for selected external Nikon Speedlights. The movie mode captures up to 40 seconds of 320 x 240 video at 15fps. There's no sound but you can zoom.

Who cares if the 990 is expensive? It's one of the best digital cameras under £1,000, but Canon's new G1 may now have the edge.

DETAILS

PRICE £849 (£722.55 ex VAT)
CONTACT Nikon 0800 230 220
www.nikon.co.uk

PROS Excellent control; superb physical and optical quality; best macro

CONS Relatively large and expensive; no sound; Microdrive incompatibility

OVERALL Semi-pros and Nikon-philes will love the 990, but consider the Canon G1

| | |
|-----------------|------|
| FEATURES | ★★★★ |
| PERFORMANCE | ★★★★ |
| VALUE FOR MONEY | ★★★★ |
| OVERALL RATING | ★★★★ |



Olympus Camedia C-3030 ZOOM

FULLY FEATURED



camera; and the macro mode focuses to an unremarkable 20cm. You can use the optical viewfinder for composition, or the 1.8in TFT display, which lets you zoom in up to three times on images during playback. The screen also displays a wealth of information during use, indicating exposure, compensation, and even a representation of manual focusing distance.

Aperture priority offers 13 settings from f2.8 to f11, while shutter priority mode ranges from one second to 1/800; in fully manual, you can extend exposures to 16 seconds.

Two levels of compression are available at the maximum resolution, and there is also an uncompressed tiff mode. Best-quality 2,048 x 1,536 jpegs measure around 1,600KB each, and Olympus supplies a 16MB SmartMedia card as standard.

Flash options are comprehensive, with the usual force on/off and red-eye

OLYMPUS' 3030 is essentially a version of the earlier 2020 model, but with the crucial additions of USB, a 3.3megapixel CCD, and a fetching black finish. It measures 109 x 76 x 66mm, and weighs 300g without batteries.

The 3030 is powered by four AAs or a pair of CR-V3 lithium batteries – Olympus supplies the latter, but you'll have to buy your own recharger.

The 3x optical zoom lens is equivalent to 32-96mm on a 35mm

reduction complemented by a slow-syncro mode that can be set for a front or rear curtain; there's also a sync plug for an external flashgun, and a tiny infra-red remote control thrown in.

The movie mode captures video clips with sound, limited by memory. The standard 16MB can capture 55 seconds worth at 320 x 240 in 15fps. Video and audio can be replayed through a TV set and audio clips can also be added to describe still pictures; the 3030 doesn't have a built-in loudspeaker though. Uniquely, the 3030 can crop and edit movie clips within the camera itself.

This is a good camera, but the competition is better on some features.

DETAILS

PRICE £799 (£680 ex VAT)

CONTACT Olympus 0800 072 0070

www.olympus.co.uk

PROS Longest 16-second exposures; finest aperture control; in-camera movie editing

CONS No mains supply or rechargeable batteries as standard

OVERALL Another good 3.3megapixel camera, but beaten by others

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING

★★★★

★★★★

★★★

★★★★

Sony Cyber-shot DSC-S70

FULLY FEATURED



90 minutes with the supplied charger.

Disappointingly, Sony supplies the S70 with a meagre 8MB Memory Stick. Best-quality 2,048 x 1,536 pixel jpegs measure around 1,300KB, and there are lower 1,600 x 1,200, 1,280 x 1,024 and 640 x 480 modes, plus uncompressed 9MB tiffs and a mono-gif mode.

The S70 is equipped with a 3x Carl Zeiss optical zoom, equivalent to a 34-102mm lens on a 35mm camera. Macro mode works as close as

4cm. The relatively large 2in display allows you to smoothly zoom in up to five times and scroll around images during playback, but when capturing pictures, it doesn't quite show 100 per cent coverage. Annoyingly, both displays show number of pictures taken, not number remaining.

Shutter speeds range from eight to 1/1000 seconds, and there are nine aperture settings from f2.0 to f8.0; you have the choice of auto, manual,

SONY'S S70 IS PRETTY compact for a fully-featured 3.3megapixel digital camera, measuring 125 x 62 x 39mm – the lens does stick out a little though.

Rather than the 60-90 minutes solid use of most digital cameras, the S70's battery is good for up to 150 minutes. It's one of Sony's InfoLithium models too, which feeds back precisely how many minutes of charge are remaining on the screen. The battery charges within the camera in around

aperture or shutter priority modes.

Exposure compensation is available from +/- 2EV in 1/3 stops, and there's a spot metering option. The flash can fire brighter or dimmer, along with forced on, off, and red-eye modes. The S70 automatically fires its flash at the end of long exposures and there's also a sync option to an external flash unit.

Movie mode captures up to 15 secs of video at 320 x 240 or 60 secs at 160 x 120, both at 15fps with mono audio; and there's a built-in speaker. Files are stored in MPEG-1 format.

Image quality is superb, but it's the long battery life and feedback that really score – shame about the 8MB memory.

DETAILS

PRICE £699 (£594.89 ex VAT)

CONTACT Sony 0990 111 999

www.sony.co.uk

PROS Great quality; good control; unparalleled battery life with feedback

CONS 8MB of memory is half the standard; there's also little to grip

OVERALL One of the best all-round 3.3megapixel cameras

FEATURES

PERFORMANCE

VALUE FOR MONEY

OVERALL RATING



★★★★★

★★★★

★★★★

★★★★

How we did the tests

Digital cameras may not use film, but they share many performance issues with their analogue counterparts. Lenses still have to focus an image sharply with the minimum of distortion. Electronics and mechanics must respond as quickly as possible to user requests, such as pressing the shutter at a critical moment. Flashes should illuminate naturally while minimising red-eye effects. Exposure and metering systems should provide the required level of control, while still delivering a decent image.

We developed a number of tests to see how the cameras performed in terms of resolving power, compression artefacts, electronic noise, optical distortion, macro capability and effectiveness of red-eye flash reduction. For all tests we set each camera to its highest optical resolution and best-quality jpeg. The exposure and white balance were set to automatic. We believe these to be the most common conditions under which digital cameras are used.

Our first main test pushed the camera's optics. We mounted a set of Paterson optical targets

(available from Jessops) on a wall, and positioned each camera in turn on a tripod 180cm away. We then adjusted the lenses until the arrangement filled the width of the frame as viewed on the LCD monitor (apart from the budget Agfa model where the optical viewfinder was used); each zoom lens was approximately mid-way through its range.

We used the camera displays to compose the pictures at close range because the optical viewfinders suffered from parallax effect and didn't give an accurate representation of coverage. This also allowed us to measure the displays' coverage compared to what was captured.

The test patterns revealed any geometric distortions, while the repeating shapes allowed sharpness to be compared between the centre and corners.

Our second main test was to take a picture of Tower Bridge on a sunny winter's afternoon. Again, all cameras were mounted on a tripod in the same location, and to minimise lighting differences, all models were tested immediately after each other within a 15-minute period.



To test macro modes we photographed a £2 coin as closely as possible. The example above was taken with the Sony S70 from 4cm away. Compare with this month's pcwexpert Results pages to see the Nikon CoolPix 990's extremely close macro mode at 2cm, and the Epson 3000Z's at a modest 20cm

We tried hard to ensure that the composition was identical in each case, adjusting the zoom's focal length until each camera recorded the same picture.

Overleaf are enlarged sections of both pics that show the combined effectiveness of optics, metering, exposure and compression for each camera.

Our third test measured how near each camera could

focus in macro mode, by simply getting as close as we could to a £2 coin and still obtain a sharp image.

Taking pictures in party environments is always a tough test of red-eye reduction modes, focusing under low light and flash-based exposures, so we also tested each camera under similar conditions. We plunged a room into near darkness, set the cameras to red-eye reduction mode and took a photo of the same person from a couple of metres away and looked out for poor exposures and devilish pupils.

We also used each camera for as long as possible, taking many photos under a variety of conditions. As with a film camera, we looked for handling issues, optical distortions and poor exposures or metering. We closely examined images for electronic noise and compression artefacts that often plague digital cameras.



Standard Paterson targets were used to test the camera's optics and the CCD resolving power. The target's straight edges reveal any geometric distortions at the sides, while the various shapes and patterns push the camera's overall resolving power to the limits



To test automatic exposure and resolving power, we photographed London's Tower Bridge on a sunny day. Over the page we have reproduced a section including the right-hand spire to reveal resolved detail and any jpeg compression artefacts



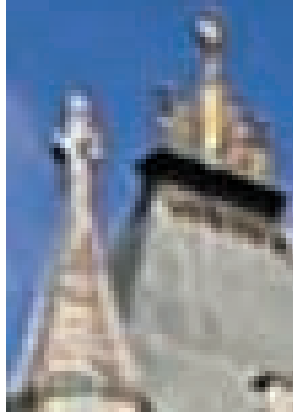
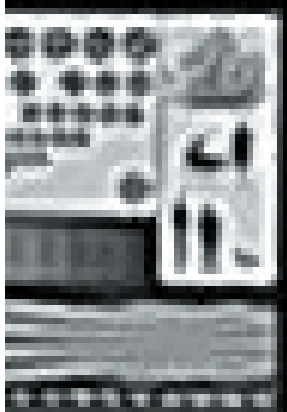
How they compared

The pictures below are zoomed sections of the test photos shown to the right. The Tower Bridge image was enlarged to the size of these two Results pages, then a small area was cropped to test the resolving powers of each camera's CCD. Our test pattern was also enlarged and cropped, as well as being examined for uniform sharpness across its surface.



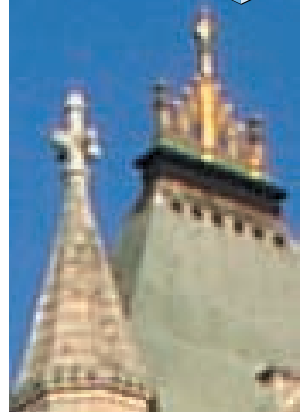
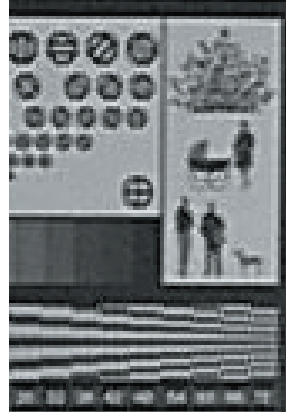
Agfa ePhoto CL18

BUDGET



Epson PhotoPC 650

BUDGET



Canon Digital Ixus

COMPACT



Fujifilm FinePix 40i

COMPACT



Kodak DC3800

COMPACT



Sony Cyber-shot DSC-P1

COMPACT



Canon PowerShot G1

FULLY FEATURED



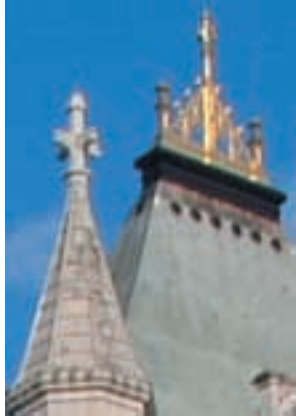
Epson PhotoPC 3000Z

FULLY FEATURED



Fujifilm FinePix 4900Zoom

FULLY FEATURED



Kodak DC4800

FULLY FEATURED



Nikon CoolPix 880

FULLY FEATURED



Nikon CoolPix 990

FULLY FEATURED



Olympus Camedia C-3030 ZOOM






FULLY FEATURED








Sony Cyber-shot DSC-S70





FULLY FEATURED



| Table of features | Budget | | Compact | | |
|---------------------------|---|---|--|---|---|
| |  |  |  |  |  |
| MANUFACTURER | AGFA | EPSON | CANON | FUJIFILM | KODAK |
| NAME | EPhoto CL-18 | PhotoPC 650 | Digital IXUS | FinePix 40i | DC3800 |
| Price inc VAT (ex VAT) | £118 (£100.43) | £225 (£191.49) | £529 (£450.21) | £549 (£467.23) | £349 (£297.86) |
| Telephone | 020 8231 4903 | 0800 220 546 | 0121 666 6262 | 020 7465 5745 | 0870 243 0270 |
| URL | www.agfa.co.uk | www.epson.co.uk | www.canon.co.uk | www.fujifilm.co.uk/di | www.kodak.com |
| QUALITY & STORAGE | | | | | |
| Image sensor | 0.3megapixel CMOS | 1.09megapixel CCD | 2.1megapixel CCD | 2.4megapixel Super CCD | 2.1megapixel CCD |
| Removable storage | ✗ | Compact Flash | Compact Flash | SmartMedia | Compact Flash |
| Storage capacity | 2MB built-in | 8MB card supplied | 8MB card supplied | 8MB card supplied | 8MB card supplied |
| Microdrive compatibility | ✗ | ✗ | ✗ | ✗ | ✗ |
| Best quality jpegs | 125KB | 250KB | 1,600KB | 1,700KB | 500KB |
| Compression | jpeg | jpeg, uncompressed tiff | jpeg | jpeg | jpeg |
| Resolutions | 640 x 480 | 1,152 x 864 640 x 480 | 1,600 x 1,200 640 x 480 | 2,400 x 1,800 scaled 1,280 x 960 640 x 480 | 1,792 x 1,184 896 x 592 |
| OPTICS | | | | | |
| Optical zoom | ✗ | ✗ | 2x | ✗ | ✗ |
| Digital zoom | ✗ | ✗ | 4x | ✗ | 2x |
| Focal length (35mm equiv) | 45mm | 33mm | 35-70mm | 36mm | 33mm |
| Actual focal length | 7.2mm | 6mm | 5.4-10.8mm | 8.3mm | 6.9mm |
| Aperture (min-max zoom) | f2.0 | f2.0 | f2.8-4.0 | f2.8 | f2.8 |
| Focus range | Unknown | 30cm to infinity | 57cm to infinity | 50cm to infinity | 50cm to infinity |
| Macro focus distance | N/A | 15cm | 10cm | 6cm | 20cm |
| Auto focus | ✓ | ✓ | ✓ | ✓ | ✓ |
| Manual focus | ✗ | ✗ | ✗ | ✗ | ✗ |
| EXPOSURE | | | | | |
| Shutter priority/steps | ✗ | ✗ | ✗ | ✗ | ✗ |
| Aperture priority steps | ✗ | ✗ | ✗ | ✗ / 2 | ✗/2 |
| Exposure compensation | ✗ | ✗ | plus/minus 2.0EV 1/3 steps | plus/minus 1. 5EV 1/3 steps | ✗ |
| Shutter speeds | Unknown | 1/4-1/750 | 1sec-1/500 | 1/4-1/1000 | 1/2-1/1000 |
| Flash modes | Auto, off | Auto, forced, red-eye, off | Auto, forced, slow sync, red-eye, off | Auto, forced, slow sync, red-eye, off | Auto, forced, red-eye, off |
| External flash hotshoe | ✗ | ✗ | ✗ | ✗ | ✗ |
| FEATURES | | | | | |
| LCD screen | ✗ | 1.8in | 1.5in | 1.8in | 1.5in |
| Optical viewfinder | ✓ | ✓ | ✓ | ✓ | ✓ |
| ISO rating | 200 | 140 | 100 | 200 | 100 |
| Interfaces | USB | Serial | USB | USB | USB card reader supplied |
| Audio recording | ✗ | ✗ | ✗ | ✓ and MP3 | ✗ |
| Video recording | ✗ | ✗ | ✗ | 320 x 240 10fps | ✗ |
| Loudspeaker | ✗ | ✗ | ✗ | ✗ | ✗ |
| Batteries | 2 x AA | 4 x AA | Lithium-ion | 2 x AA | 2 x AA |
| Recharger supplied | ✗ | ✗ | ✓ | ✓ | ✗ |
| AC adaptor supplied | ✗ | ✗ | ✓ | ✗ | ✗ |
| TV output | ✓ | ✓ | ✓ | ✓ | NTSC only |
| Dimensions (h x w x d) | 66 x 105 x 37mm | 72 x 135 x 57mm | 57 x 87 x 27mm | 71 x 86 x 29mm | 33 x 94 x 61mm |
| Weight (not inc battery) | 117g | 315g | 190g | 155g | 165g |

| Fully featured | | | | |
|--|---|---|--|---|
|  |  |  |  |  |
| SONY | CANON | EPSON | FUJIFILM | KODAK |
| CYBER-SHOT DSC-P1 | POWERSHOT G1 | PHOTOPC 3000Z | FINEPIX 4900 ZOOM | DC4800 |
| £699 (E594.89) | £799 (E680) | £799 (E680) | £799 (E680) | £699 (E594.89) |
| 0990 111 999 | 0121 666 6262 | 0800 220546 | 020 7465 5745 | 0870 243 0270 |
| www.sony.co.uk | www.canon.co.uk | www.epson.co.uk | www.fujifilm.co.uk/di | www.kodak.com |
| 3.3megapixel CCD | 3.3megapixel CCD | 3.3megapixel CCD | 2.4megapixel Super CCD | 3.1megapixel CCD |
| Memory Stick | Compact Flash | Compact Flash | SmartMedia | Compact Flash |
| 8MB card supplied | 16MB card supplied | 16MB card supplied | 16MB card supplied | 16MB card supplied |
| x | ✓ | Not certified | x | x |
| 1,300KB | 1,500KB | 780KB | 1,600KB | 600KB |
| jpeg, gif, uncompressed tiff | jpeg, proprietary raw | jpeg, uncompressed tiff | jpeg, uncompressed tiff | jpeg, uncompressed tiff |
| 2,048 x 1,536 1,600 x 1,200 1,280 x 1,024 640 x 480 | 2,048 x 1,536 1,024 x 768 640 x 480 | 2,544 x 1,904 HyPict 2,048 x 1,536 640 x 480 | 2,400 x 1,800 scaled 1,600 x 1,200 1,280 x 960 640 x 480 | 2,160 x 1,440 1,800 x 1,200 1,536 x 1,024 1,080 x 720 |
| 3x | 3x | 3x | 6x | 3x |
| 2x | 4x | 2x | 3.75x | 2x |
| 39-117mm | 34-102mm | 34-102mm | 35-210mm | 28-84mm |
| 8-24mm | 7-21mm | 7-21mm | 7.8-46.8mm | 6-18mm |
| f2.8-5.3 | f2.0-2.5 | f2.0-2.5 | f2.8-3.1 | f2.8-4.5 |
| 50cm to infinity | 70cm to infinity | 50cm to infinity | 50cm to infinity | 50cm to infinity |
| 10cm | 6cm | 20cm | 10cm | 20cm |
| ✓ | ✓ | ✓ | ✓ | ✓ |
| x | ✓ | ✓ | ✓ | x |
| x | ✓/40 | ✓/42 | ✓/36 | ✓/19 |
| x/2 | ✓/13 | ✓/6 | ✓/13 | ✓/3 |
| plus/minus 2.0EV 1/3 steps | plus/minus 2.0EV 1/3 steps | plus/minus 2.0EV 1/5 steps | plus/minus 2.0EV 1/3 steps | plus/minus 2.0EV 1/2 steps |
| 2 secs-1/1000 | 8 secs-1/1000 | 8 secs-1/750 | 3 secs-1/1000 | 16 secs-1/1000 |
| Auto, forced, red-eye, off, level | Auto, forced, red-eye, off | Auto, forced, red-eye, off, slow sync, rear curtain | Auto, forced, slow sync, red-eye, off | Auto, forced, red-eye, off |
| x | ✓ | ✓ | ✓ | External sync |
| 1.5in | 1.8in | 1.8in | 2in | 1.8in |
| ✓ | ✓ | ✓ | Electrical | ✓ |
| 100 | 100 | 100 | 200 | 100 |
| USB | USB | USB/serial | USB | USB |
| ✓ | ✓ | ✓ | x | x |
| 320 x 240 15fps | 320 x 240 15fps | 320 x 240 15fps | 320x240 10fps | x |
| ✓ | ✓ | ✓ | x | x |
| Lithium-ion | Lithium-ion | 4 x AA | Lithium-ion | Lithium-ion |
| ✓ | ✓ | ✓ | In-camera | ✓ |
| ✓ | ✓ | x | ✓ | ✓ |
| ✓ | ✓ | ✓ | ✓ | ✓ |
| 54 x 113 x 44mm | 77 x 120 x 64mm | 89 x 108 x 65mm | 79 x 110 x 94mm | 69 x 120 x 65mm |
| 210g | 420g | 368g | 410g | 320g |



| Table of features | Fully featured | | | |
|---------------------------|---|---|---|---|
| |  |  |  |  |
| MANUFACTURER | NIKON | NIKON | OLYMPUS | SONY |
| NAME | COOLPIX 880 | COOLPIX 990 | CAMERA C-3030 ZOOM | CYBER-SHOT DSC-S70 |
| Price inc VAT (ex VAT) | £699 (€594.89) | £849 (€722.55) | £799 (€680) | £699 (€594.89) |
| Telephone | 0800 230 220 | 0800 230 220 | 0800 072 0070 | 0990 111 999 |
| URL | www.nikon.co.uk | www.nikon.co.uk | www.olympus.co.uk | www.sony.co.uk |
| QUALITY & STORAGE | | | | |
| Image sensor | 3.3megapixel CCD | 3.3megapixel CCD | 3.3megapixel CCD | 3.3megapixel CCD |
| Removable storage | Compact Flash | Compact Flash | SmartMedia | Memory Stick |
| Storage capacity | 16MB card supplied | 16MB card supplied | 16MB card supplied | 8MB card supplied |
| Microdrive compatibility | ✗ | ✗ | ✗ | ✗ |
| Best-quality jpegs | 1,000KB | 1,000KB | 1,600KB | 1,300KB |
| Compression | jpeg, uncompressed tiff | jpeg, uncompressed tiff | jpeg, uncompressed tiff | jpeg, gif, uncompressed tiff |
| Resolutions | 2,048 x 1,536 1,024 x 768 640 x 480 | 2,048 x 1,536 1,024 x 768 640 x 480 | 2,048 x 1,536 1,600 x 1,200 1,280 x 960 XGA, VGA | 2,048 x 1,536 1,600 x 1,200 1,280 x 1,024 640 x 480 |
| OPTICS | | | | |
| Optical zoom | 2.5x | 3x | 3x | 3x |
| Digital zoom | 4x | 4x | 2.5x | 2x |
| Focal length (35mm equiv) | 38-95mm | 38-115mm | 32-96mm | 34-102mm |
| Actual focal length | 8-20mm | 8-24mm | 6.5-19.5mm | 7-21mm |
| Aperture (min-max zoom) | f2.8-4.2 | f2.5-4.0 | f2.8 | f2.0-2.5 |
| Focus range | 40cm to infinity | 30cm to infinity | 80cm to infinity | 25cm to infinity |
| Macro focus distance | 4cm | 2cm | 20cm | 4cm |
| Auto focus | ✓ | ✓ | ✓ | ✓ |
| Manual focus | ✓ | ✓ | ✓ | ✓ |
| EXPOSURE | | | | |
| Shutter priority/steps | ✓/14 | ✓/14 | ✓/42 | ✓/19 |
| Aperture priority/steps | ✓/2 | ✓/10 | ✓/13 | ✓/9 |
| Exposure compensation | plus/minus 2.0EV 1/3 steps | plus/minus 2.0EV 1/3 steps | plus/minus 2.0EV 1/3 steps | plus/minus 2.0EV 1/3 steps |
| Shutter speeds | 8 secs - 1/1000, 60secs Bulb | 8 secs - 1/1000, 60secs Bulb | 16 secs - 1/800 | 8 secs - 1/1000 |
| Flash modes | Auto, forced, slow sync, red-eye, off | Auto, forced, fill-in slow sync, red-eye, off | Auto, forced, slow sync, red-eye, off, rear curtain | Auto, forced, red-eye, off, level |
| External flash hotshoe | ✗ | External sync | External sync | External sync |
| FEATURES | | | | |
| LCD screen | 1.8in | 1.8in | 1.8in | 2in |
| Optical viewfinder | ✓ | ✓ | ✓ | ✓ |
| ISO rating | 100 | 100 | 100 | 100 |
| Interfaces | USB/serial | USB | USB/serial | USB |
| Audio recording | ✗ | ✗ | ✓ | ✓ |
| Video recording | 320 x 240 15fps | 320 x 240 15fps | 320 x 240 15fps | 320 x 240 15fps |
| Loudspeaker | ✗ | ✗ | ✗ | ✓ |
| Batteries | Lithium-ion or 2CR5 | 4 x AA | 2 x CR-V3 or 4 x AA | Lithium-ion |
| Recharger supplied | ✓ | ✓ | ✗ | ✓ |
| AC adaptor supplied | ✓ | Option | Option | ✓ |
| TV output | ✓ | ✓ | ✓ | ✓ |
| Dimensions (h x w x d) | 75 x 100 x 54mm | 149 x 79 x 38mm | 76 x 109 x 66mm | 125 x 62 x 39mm |
| Weight (not inc battery) | 275g | 370g | 300g | 280g |

Editor's Choice

First things first: we were extremely impressed with all the cameras we looked at in this group test.

Putting the two budget models briefly aside, our four pocket-sized and particularly the eight fully featured models were truly excellent products, any of which you'd be proud to own and use.

Starting at the budget end of things, the cheapest Agfa CL18 is not really suitable for print-making, instead finding its niche with online applications. You're probably better off with a cheaper dedicated webcam, or perhaps one of Creative Labs' WebCam Gos with built-in memory and cordless capabilities.

Epson's PhotoPC 650 is a different kettle of fish, however, with sufficient resolution to make at least postcard-sized prints. Sure, it doesn't come near the quality of more expensive models, but it is definitely worth having and earns a **Highly Commended** award in the budget category – the model to go for if you've less than £250 to spend.

Moving on to our pocket-sized contenders, and we have four models, each with four very different selling points. Fujifilm's FinePix 40i is unique in that it doubles up as an MP3 player. As a

camera, the 40i is incredibly small, and one of the fastest to power up and down, but in our tests, its Super CCD suffered from above average electronic noise.

Next up comes Kodak's DC3800, a compact 2.1 megapixel bargain at £350. There's virtually no control, but the quality is good and the price is right. However, awards go to those with slightly higher prices. **Canon's Digital Ixus** is also a 2.1 megapixel camera, but remains the smallest and most desirable-looking of the compacts, even boasting a 2x zoom, and earning itself a **Highly Commended** award.

Winning this section, however, is **Sony's Cyber-shot DSC-P1**, which, while bigger than the Canon and more expensive than its competitors, boasts superb control, great features (including a unique animated gif function), an InfoLithium battery and most impressively of all, 3.3 megapixel resolution and a 3x optical zoom, which retracts fully into the body. Wonderful stuff, deservedly earning an **Editor's Choice** award, despite its high £699 price tag and only 8MB of memory.

The fully featured category was toughest of all to judge, with eight truly

excellent models boasting a level of photographic control and quality we've long desired from digital cameras. Three models, however, stood out.

First up is **Nikon's CoolPix 880**, which essentially packs in the electronics of the bigger 990 into a more compact, cheaper package. Sure, there's no audio with the video and the CF slot still refuses to accept IBM's neglected Microdrive hard disk, but apart from this, it's a truly superb camera. Delve beyond the automatic and cunning scene-selection modes and you'll find the 990's industry-leading focusing and metering options. At £699, it's a bargain and earns itself a **Highly Commended** award.

As mentioned earlier, battery life is the bane of all digital cameras, but one manufacturer is ahead of the pack. We salute Sony for its innovative InfoLithium batteries, first for saying precisely how many minutes are remaining and, second, for lasting longer than anyone else's. **Sony's Cyber-shot DSC-S70** boasts around 150 minutes of solid battery life in a compact body with superb features, control and great quality. Despite only coming with 8MB, it deserves a **Highly Commended** award.

Which brings us to our overall winner in the fully featured section. **Editor's Choice** goes to the **Canon PowerShot G1**. Canon has been quiet at this end of the market since releasing its award-winning PowerShot Pro70 almost two years ago, but it's clearly been following developments very carefully. Directly targeting Nikon's superb high-end CoolPix 990, the G1 further improves the state of the art.

There's Microdrive compatibility and the first AV mode for a Canon camera, while the flip-out screen of the Pro70 has also made a welcome comeback. Better still, however, is the raw mode that losslessly compresses the untouched data from the CCD, delivering files that are around three times smaller than comparable tiffs. Best of all is a new 50 ISO mode, which reduces noise on images, producing what are probably the best pictures we've seen from a 3.3 megapixel digital camera so far.

Finally, ensure that you pick up the cameras for yourself and see how they feel. Cameras are very much a personal thing, and the best quality in the world won't make up for a model that feels wrong and is subsequently left at home.



Sony's Cyber-shot DSC-P1



Canon's PowerShot G1



Epson's PhotoPC 650



Canon's Digital Ixus



Nikon's CoolPix 880



Sony's DSC-S70

Photography: Julian Hawkins

• 6-piepak: available from The Dispensary 020 7921 9290

• Wave Snowboard Jacket: £174.95 available at MAMBO stores. For stockists call 020 8741 2444 www.mambo.com.au

• The North Face TALKEEENA ACCLIMATE PARKER: £160 for stockist call 01539 738 882 email: uksales@thenorthface.com





Combat[†] MP3

Music while you work... play... cycle...
and in a tiny format too. We put 19 MP3
players head-to-head and let them fight
it out for the sound crown

Cassette tapes and portable CD
players have had their day. The
Internet generation is chucking
them out in favour of solid-state
music players. If you've not played
with one yet, then you're missing
out on some of the smallest and cutest music
machines around.

By and large having no moving parts they run
and run on a single battery, and as the media is as
rewritable as MiniDisc or tape, once you've made
your initial investment they'll cost next to nothing
to maintain. So, with Christmas on the horizon
we've gathered together some of the most
desirable, and less so, presents on the market this
year. In all, there's a collection of 19 for you to
choose from, and each has been exhaustively
tested in the PCW office, not to mention on trains,
in the gym, on the bike ride home... in short, we
lived with them, just like you would.

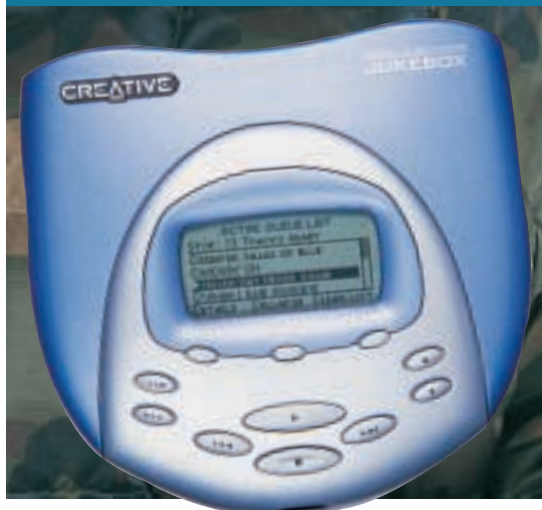
So, down with mono, enough of cassettes –
the future is here and we're testing it now.

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Lars-Goran Nilsson, Andy Gordon, Jason Jenkins, Niall
Magennis, Richard McPartland, Scott Montgomery, Nik
Rawlinson, Jalal Werfalli

Creative DAP Jukebox



AT FIRST SIGHT you'll either love the DAP Jukebox or hate it, and on that score the PCW office is split 50:50. It's about the size of a CD Walkman, making it six times the size of an average MP3 device, and tips the scales at 400g, but in its favour it stores audio on a 6GB hard drive, with room for about 150 CDs or 100 hours of music. It'll handle pretty much anything you'll throw at it as the BIOS can be upgraded to take into account emerging standards.

It supports MP3 bit rates of between 20 and 320Kbits/sec, and with so much capacity you can afford to go for the maximum. Track names are retrieved from an online database and organised in the Jukebox library according to artist, album name, track name and genre, making it easy to find what you want to hear. A seven-line display makes navigating the system easy, and playlists can be built and saved for later use. A good selection of EAX

(environmental audio) controls lets you tailor the output to sound exactly the way you like it.

Of course, with a hard drive you have moving parts, so Creative has included an 8MB shock buffer, which should be enough to cope with up to five minutes of skipped reads. PC connection is via the USB cable, but it also has line in and stereo line out ports for added versatility. At the front there's an infrared window for a forthcoming remote

control, and it comes bundled with four rechargeable AA Ni-MH batteries with a stated life of around five hours.

The bundled PlayCenter 2 software takes care of ripping and downloading tracks. In our tests it managed to transfer our single large test file in one minute 24 seconds, making it among the fastest in the group, and the collection of six mixed files was completed in one minute 46 seconds, which again put it close to the head of the pack.

It is important to not compare the Jukebox directly with the smaller devices on test here, as it is a fundamentally different product that performs a different set of tasks. However, if you are after a higher capacity, versatile music device then this is one to consider.

DETAILS

★★★★

PRICE £349 (£297.02 ex VAT)

CONTACT Creative 01189 344 744

www.europe.creative.com

PROS Huge capacity; good track organising features

CONS Not everyone will find it attractive

OVERALL Best looking of the hard-drive-based players, and one that has the potential to keep up with emerging standards

Cybercomp MPGenie



THIS IS ONE OF THE fastest of the MP3 players in this round-up, but it does lack in other ways, in part because it is made out of something that feels like the plastic used to build cheap toys.

The MPGenie feels very flimsy, especially the covers for the interface cable and the battery hatch. We were generally a bit worried that something was going to snap off when we opened its various protecting covers. Even the buttons are made out of the same

material and are small and fiddly to press.

On the brighter side, it does come with 64MB of memory, which is enough for an hour of good-quality audio. It also sports a full graphical LCD and a reasonable number of equaliser settings for tweaking the audio output. As far as audio quality goes, there isn't much wrong with the MPGenie except that it has the same problem with variable bit rate files as most of the other players on test, in that the

track time counter does not progress between numbers at an even rate.

But enough of the criticism – even though it uses a parallel connection, this is the one of fastest players on test in terms of download speed, outperforming many players with USB connection. It took 41 seconds to complete our large file transfer test and just 57 seconds to upload the collection of six test tracks. The LCD is a bonus as it can show a lot of information at one time.

The MPGenie is powered by a single AA battery. The sound quality on the bundled headphones is appalling, but that can be said for most of players tested here, so make sure you have some money left to buy a decent replacement set. The software is pretty basic and we were very disappointed by the user interface. It does, however, allow you to get MP3s from the player back onto your PC, although when we tested this feature the software successfully sent one file and then hung for no apparent reason.

If it wasn't for the poor build quality this could have been an excellent player, but we can't recommend it at this price.

DETAILS

★★

PRICE £219.95 (£187.19 ex VAT)

CONTACT MP3 Players 01753 570 800

www.mp3players.co.uk

PROS Memory size; good display; fast download speed

CONS Build quality and price

OVERALL This player has great potential if Cybercomp improves its overall build quality, but as it stands it feels like it's going to break as soon as you take it out of the box

Digit@lway MPIO 64SV



WITH 64MB OF ONBOARD memory, the MPIO 64SV can store an hour of music – more if compression is increased. At the back is one SmartMedia card slot that can take another 32MB card. On the front, the oval-shaped LCD can display 12 numbers and 18 letters, necessary because the MPIO 64SV supports ID3 tag information to display artists' names and song details. Below the LCD is a four-way button for the play/pause, skip and stop controls. Erase,

mode select and voice record buttons also reside on the fascia. Along the top of the unit, controls for volume, repeat, and Digital Signal Processing (DSP) are all easy to operate while the player is in your pocket.

There is also a phone book that holds 250 names and numbers, and a digital camera module. By plugging this into the 25-pin data port interface, you can capture and save images onto the internal memory or a SmartMedia card. As for

image quality, don't hold your breath. The 300,000-pixel CMOS captures quite noisy pictures, but you can store 108 photos in VGA mode and 434 photos in SIF (standard image format) mode. Performance-wise, it took two minutes 50 seconds to complete our large file transfer test but a slower three minutes 32 seconds to upload the six test tracks. Transferring these files to the MPIO 64SV (or MPIO SV-64 as sold by MP3 Players) is simple using the MPIO

Desk software on the included CD-ROM. The CD also contains 'Jet Audio' for converting CD music into MP3s, but there's no support for wma files (see How we tested page 235).

Sound quality is good and is matched by the clarity of the voice recorder. The headphones aren't top-notch but they suffice. To tweak the audio, you can use the Pop, Rock, and Classic DSP settings.

This is a fully featured MP3 player at a reasonable price. The camera facility is interesting, but is a strange marriage. There's also an FM radio that performs adequately if there's a strong signal.

DETAILS

- ★★★★
- PRICE** MP3 Players £199.95 (£170.17 ex VAT); digital camera £84.95 (£72.30 ex VAT)
- CONTACT** MP3 Players 01753 570 800 www.mp3players.co.uk
- PROS** Adequate performance; 64MB of memory; camera option
- CONS** Camera's price and image quality; no wma support
- OVERALL** An MP3 player at an OK price considering the extra features. The digital camera module won't appeal to all and is a little expensive. One gets the feeling that this MP3 player is trying to do too much

Digit@lway MPIO DMJ-64



THIS HAS THE LOOK of a mini disc player, although it is slightly smaller. The front of the unit has the control button for the various functions, along with a small screen to display playback information. There is also a button for activating the voice recorder, with the small microphone situated above the display. The unit has 64MB of memory as standard, allowing about an hour of music to be stored. A slot on the left takes memory cards for upgrading.

The display shows the battery level – it takes a single AA – along with the track number and name. By pressing the equaliser/3D button various presets can be used to get the most from playback. This isn't as versatile as treble and bass controls, but it is adequate.

Pressing an orange button activates the voice recording option, then you just speak into the player and it stores the resultant file with an sc4 extension, which is

converted to a wav file when it is uploaded to a PC. Underneath a sliding protective cover is a port to which you can connect a cable that plugs into your PC's parallel port. The bundled software is MPIO Desk, which allows MP3s to be transferred between the player and the PC. There is no ripping software included though, so you will need to download or buy a suitable applet. The package does include a

telephone book feature though. Add names and addresses to your PC and download them to the player. The display can then be used as a mini telephone directory, although inclusion of ripping software would have been more useful.

Downloading the large 21.5MB test file took two minutes 48 seconds, while the six-file transfer took three minutes 26 seconds – overall pretty slow.

Overall, the DMJ-64 (which MP3 Players calls the SJ-64) is a cool-looking, small player with voice recording capabilities. The lack of ripping software is an irritation, but with good sound quality and 64MB onboard, it's perhaps worth its £189.95 price tag.

DETAILS

- ★★★★
- PRICE** £189.95 (£161.66 ex VAT)
- CONTACT** MP3 Players 01753 570 800 www.mp3players.co.uk
- PROS** Voice recording facility; 64MB memory
- CONS** No ripping software; slow download times
- OVERALL** A pretty good MP3 player, although downloading times and the lack of ripping software leave it behind some of the others on test



Digit@lway MPIO EX-MP64



APPEARANCE IS important when it comes to MP3 players and the MPIO EX-MP64 certainly doesn't look dull.

It's a reasonable size and comes with 64MB of built-in memory as standard. All in all, this should be an excellent player, but it does lack a lot of the features offered by some of the other devices. It's very basic, with an alphanumeric LCD, parallel port interface and very low-end transfer software, but it's also one of the cheapest 64MB MP3 players we've

tested, coming in just under £160.

Build quality isn't bad – even though the EX-MP64 is made out of plastic; it is not the cheap kind used for some of the other players we've seen.

The button layout is fairly good with most of them located where you'd expect to find them. The data port and a smart media slot sit on the right-hand side. As far as audio quality is concerned the EX-MP is on a par with most of the other players we've tested and it

has three preset equaliser modes to choose from, but don't bother with the included headphones since their sound quality is less than inspiring.

The MPIO EX-MP64 (sold by MP3 Players as the MPIO X-64) did have some minor problems when it came to variable bit rate MP3s, as the one we tested seemed unable to display the time correctly. This didn't have any impact on playback, though, and is a rather minor issue.

Speed-wise the performance was nothing to write home about, transferring our large standard test file in just seven seconds short of three minutes. Uploading our six mixed files took three minutes 38 seconds. These times are passable but don't stand up to comparison with other players on test here.

What is a bit annoying, however, is the ejector for the SmartMedia cards, which is really flimsy and doesn't stay in position without a card inserted. The download software is very basic, but you can simply drag and drop the files from the top window to the bottom and you'll be asked if you'd like to transfer the selected tunes to the player.

All in all this is a reasonable player with a few minor quirks but it's not overpriced for a 64MB unit.

DETAILS

★★★★

PRICE £159.95 (£136.13 ex VAT)

CONTACT MP3 Players 01753 570 800

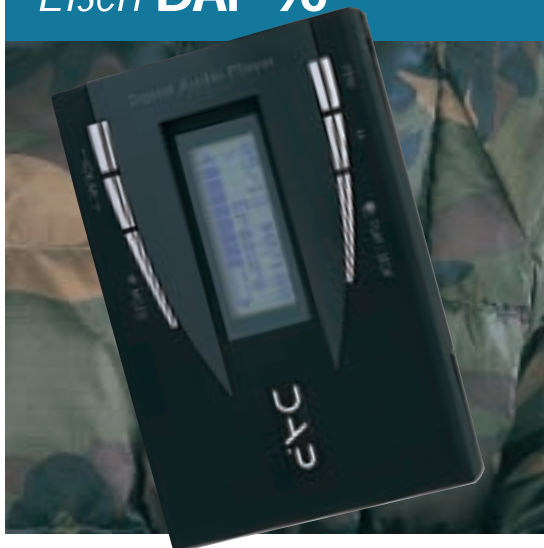
www.mp3players.co.uk

PROS Price; memory size

CONS Parallel interface

OVERALL A reasonable player for the price but it lacks any extras

Eisen DAP 96



THE BODY OF THIS quality little MP3 device has a rubbery feel, so it won't slip out of your hands, and the silver control buttons sit above and below the screen giving access to the unit's functions. Apart from the headphone socket, the only other port is where the player connects to your PC. The link cable connects to the parallel port, which at first seemed to be a poor data transfer option. However, the transfer times to the DAP proved us wrong.

By pressing the Mode button you can cycle through the various options. When you switch the DAP on the current track name is displayed, along with its position relative to the others, ie 4/12. Cycling through the modes gives you access to the Play modes (repeat track, random order); the bass and treble controls; the backlight controls; and information on the internal 96MB memory and any other memory installed.

The backlight only activates for a couple of seconds when a key press is detected, prolonging battery life, although the light can be switched off completely. A single AA battery is used to power the unit, and the SmartMedia memory card is inserted via the battery compartment before installing the battery.

Despite the parallel port, when it came to downloading this was one of the fastest units on test, transferring the 21.5MB file in one minute 21

seconds, and the six-file collection in one minute 40 seconds. The unit doesn't recognise wma files, but had no problems with variable bit rate format.

The bundled ripping software was trial versions of Music Match, Nex Encode and Audio Catalyst. For general upload and download, DAP Manager allows MP3 files to be uploaded and downloaded to the PC. It may be expensive at £229.95 inc VAT, but with 96MB of memory as standard you can store about 90 minutes of music. Compared to the cheaper units and the cost of upgrading their memory to the same level, this looks like pretty good value. Overall, an excellent player.

DETAILS

★★★★★

PRICE £229.95 (£195.70 ex VAT)

CONTACT MP3 Players 01753 570 800

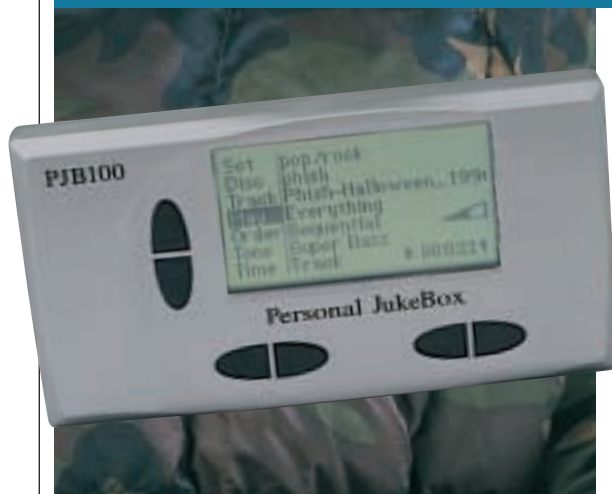
www.mp3players.co.uk

PROS 96MB of memory; backlight; treble and bass controls

CONS Quite expensive, although perhaps not with the memory included

OVERALL This is an excellent player with memory to store a lot of tracks. It is small, versatile and has good-quality sound

HanGo PJB100



To load up tracks you install the Jukebox Manager software and connect the device to your USB port. The software is pretty plain offering Explorer-style management of the contents of the player's hard drive as well as MP3 encoding of CDs. You can add MP3 tracks you have stored on your PC's hard drive, but we found that after selecting large numbers of tracks in one go the software tended to crash mid-way through the download. This is

THE PJB100 ISN'T going to win any design awards. It's the MP3 equivalent of a Volvo estate car – a big square lump that's almost painful to look at.

This can partly be put down to the fact that HanGo had to find a way to accommodate the 6GB IBM 2.5in drive. However, Creative had the same problem with its Jukebox, the only other product in this test that features a built-in hard drive, yet it managed to produce a much more appealing device.

obviously frustrating when you're trying to fill up all that space.

The Koss headphones have excellent sound quality, especially when it comes to bass response. However, we found them visually very unappealing and were subjected to several strange looks while wearing them.

HanGo claims that the lithium-ion rechargeable battery will last for 10 hours between charges. This is achieved by only spinning up the hard drive at the

start of a song to load it into the buffer memory. It also means the player won't skip if you walk around with it in your pocket. However, if you shake the device vigorously while it's trying to load audio into the buffer memory it can lock up.

It's difficult to like the PJB100. It does what it's meant to do, with the exception of the buggy connection software, but the overall look and feel of the unit resembles a prototype more than a finished consumer product.

Considering that the Creative Jukebox has a recording option, multiple DSP effects, a much better design, a better range of audio connections and costs nearly half the price, it's really impossible to recommend the PJB100.

DETAILS

★★

PRICE £595 (£506.38 ex VAT)

CONTACT HanGo 01425 481 222

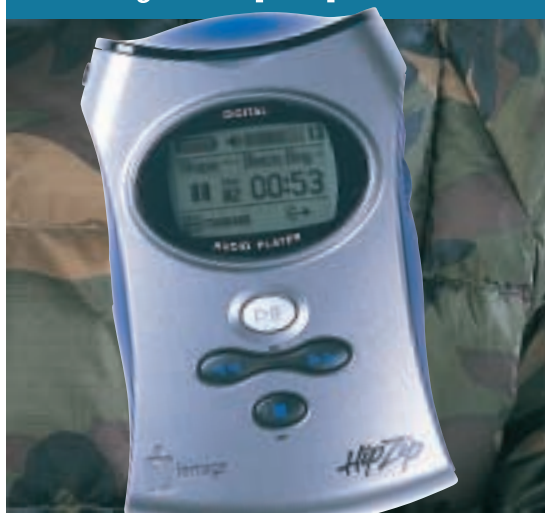
www.pjbox.co.uk

PROS Good sound quality; player works as it should

CONS Way too expensive; looks ugly

OVERALL The PJB100 would have been a good product a few months ago, but it just pales into insignificance next to the Creative Jukebox

Iomega HipZip



costs only £7 for each additional 40MB, making the idea of keeping a library of ripped tracks viable.

Sound quality is fair, and better than many of the others tested here. The display, too, is first class, with a large track counter, scrolling track name, permanent display of the volume and remaining charge of the in-built rechargeable battery. The sides of the device are covered in an appealing blue plastic,

and it's bundled with a sporty holster that you'll not be ashamed to flash around in public.

The play and stop control buttons are at the front, and between them sits a rocker for scooting back and forth through the tracks. Using these to fast-forward, though, has the curious effect of speeding the clock through the track but continuing to play at normal speed from the point where the reading head is already located. Once

THE HIPZIP IS CERTAINLY not small, but it is good looking. Weighing almost 200g it's not particularly light, either, but it does have one thing going for it – the cheapest storage around, and bucketloads of it. Once called the CliK! disc, Iomega's smallest media has been renamed the Pocket Zip, and two of these are bundled with the HipZip. Holding 40MB each you get a headstart over most other players tested here, and upping your quota

you let go it jumps ahead to the new location almost immediately, but it does feel rather as though you're driving blindfolded.

Transfer times were nothing special, standing at two minutes 18 seconds for the large test file and three minutes two seconds for our collection of six mixed files. The player is bundled with Music Match Jukebox, but also includes Iomega's standard operating software, allowing you to use the device as an external storage drive, connected via the USB port.

In all, Iomega's HipZip is an attractive, versatile and cheap-to-run device. The sound quality is above average, and it's certainly one to watch. The initial investment is a little steep, though.

DETAILS

★★★★

PRICE £289.99 (£246.80 ex VAT)

CONTACT Iomega 01628 822 444

www.iomega.com

PROS Cheap media; attractive

CONS Strange fast-forwarding control

OVERALL It's won us over, but the unit price might be the factor that decides whether it's right for you



MPMan F35-T3



THE MPMAN IS A bit of a jack-of-all-trades. It's not only an MP3 player, but also an FM radio and voice recorder. This extra functionality is reflected in the overall size of the unit – it's slightly larger than most of the MP3-only players, but not by much.

The aluminium casing gives the device a clean and sleek appearance, but other than this the design is not going to help it stand out from the crowd.

Connection to a PC is via the mini

USB port located on the right-hand side of the player. As a result, transfers of files to the device are reasonably speedy, however the MPMan was beaten in our transfer tests by the DAP, which is a parallel port device.

The software that controls these transfers is quite basic. It doesn't include any MP3 encoding features, but it does allow easy Explorer-style management not only of the transfer of MP3 files, but also presets for the FM radio, voice recordings and even memos.

However, the MPMan only has 32MB of onboard memory so there's much space to fill unless you shell out for extra Flash memory – you can add cards of up to 64MB in size.

Voice memos are transferred to the PC as ADPCM compressed wav files that can be played back using pretty much any audio software.

Apart from the lack of memory, the

only other real downer is the low output volume. The MPMan is much quieter than the other devices in this test – even at full volume its headphones are never pushed to the point of distortion. This may be a problem if you have lots of MP3 songs that haven't been normalised during the encoding process and as a result play back quietly.

Also, the device doesn't support playback of wma files, although it can handle MP3 files encoded using variable bit rate compression.

The MPMan is a good all-round device, but the low output volume and stingy amount of onboard memory count against it.

DETAILS

★★★★

PRICE £159.95 (£136.13 ex VAT)

CONTACT MP3 Players 01753 570 800

www.mp3players.co.uk

PROS Three-in-one functionality; good sound quality; headphone remote control

CONS Only 32MB of memory; low output volume

OVERALL The MPMan is a well-designed device, but the stingy memory quota and the low output volume take it down a notch

Philips Rush SA126



THIS MAY NOT BE the smallest device on test, but it's no brute either and has one of the most stylish designs of any solid-state player we've seen.

This is partly down to the choice of screen. Philips has opted for a rather strange LCD display that has a silver background. It looks great and really sets off the player's design, but it can be hard to read because the silver is so reflective. Also, there's no backlight, so you won't be able to read it in the dark.

There's no built-in memory, either. Instead Philips has shipped the Rush with a 64MB SmartMedia card. However, the device will only accept SDMI-compliant SmartMedia cards with an ID logo, not the ordinary cards used in PDAs or digital cameras.

Sound quality is excellent and MP3 rates of up to 224Kbits/sec are supported. The Rush can also handle MP3 files encoded using variable bit rates and can play back wma files, although it

does convert these to sm3 files when transferring to the player.

You can connect the Rush to a PC using either your USB or parallel port. Files are transferred using the RealJukebox software from RealNetworks. However, the version Philips has supplied will only encode MP3 files at 96Kbits/sec and not at the 128Kbits/sec rate that most people use. If you want to be able to encode at 128Kbits/sec you'll have to pay

\$29.99 (around £19) to upgrade to RealJukebox Plus. Unfortunately, you can't upgrade to RealJukebox version 2, because Philips hasn't written a plug-in for this software yet. This means that the Rush is currently not compatible with Windows 2000.

Another problem is the headphones. They're not really up to the job as they suffer from a crusty top end and have difficulty processing higher frequencies such as cymbals, so if you do opt for the Rush, you'd be well advised to replace the headphones quite quickly.

All in all, the Rush looks and sounds great, but it's let down by the poor support software and less-than-adequate headphones.

DETAILS

★★★★

PRICE £269 (£228.94 ex VAT)

CONTACT Philips 020 8665 6350

www.rush.philips.com

PROS Stylish design; good sound quality

CONS Poor software; reflective screen; low-quality headphones

OVERALL It's a great shame that Philips hasn't done a better job on the Windows software for the Rush, as the hardware is superb

Pine D'Music SM-320F



AS MP3 PLAYERS GO, the SM-320F is a feature-packed bit of kit. It may look identical to the SM-320V (reviewed below) but this player comes with an FM radio tuner. Add to that the ability to store MP3 music or data and create voice recordings for less than £150 and you're getting a reasonably good deal.

In the looks department, the SM-320F is a little lacking – that garish blue is just a little too bright for our liking, but there's no denying it's a sturdy unit

and should withstand more than a few knocks at the bottom of a bag. It's also lightweight, easy to use, and is capable of producing good-quality sound (once you've boosted the bass using the jazz and pop equalisation settings).

The four-way rocker control on the front provides an easy way of navigating through the stored tracks. Above this is a three-line screen informing you what's playing but, unlike the S3 Rios, you can't manage

your playlist on the device itself. Below the rocker controls are the equalisation settings, while the volume control is on the left-hand side; along with record and session repeat buttons.

Unfortunately, the player comes with just 32MB of internal memory (although it can support up to 64MB using the SmartMedia slot). At this price that may be just about excusable, but we can't be quite so forgiving when it comes to the fact that the unit connects to your PC via

a parallel cable. Admittedly, it's an EPP cable and the unit managed much faster transfer times than the SM-320V, but it was overshadowed by the USB-connecting players. Transfer of our large test file took three minutes 56 seconds, while the six mixed files completed the journey in four minutes 49 seconds.

On the software front, like the SM-320V, the unit ships with D'Music Manager and while it works well enough, the track window doesn't always refresh automatically. There are also no other supported audio formats – it's MP3 or nothing for the 320F.

A reasonably priced product that does a reasonable job, although build quality isn't the best on test and we'd much prefer 64MB of onboard memory.

DETAILS

★★★

PRICE £148.95 (£126.77 ex VAT)

CONTACT MP3 Players 01753 570 800

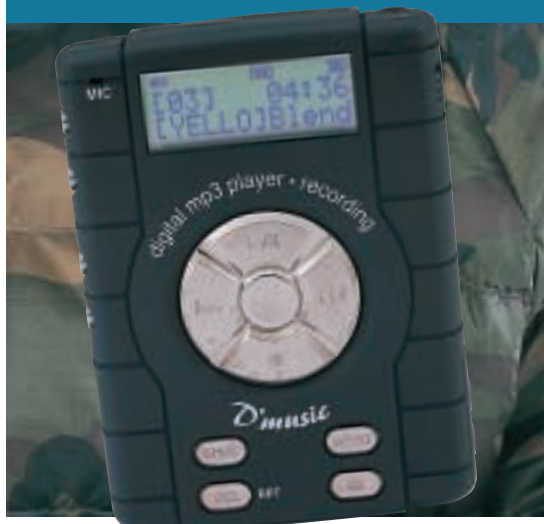
www.mp3players.co.uk

PROS Includes a voice recorder and FM radio

CONS Only 32MB of onboard memory; build quality not the best on test

OVERALL Reasonably priced and fully featured – it's just a shame there's only 32MB of onboard memory

Pine D'Music SM-320V



THE D'MUSIC SM-320V comes complete with 32MB of internal Flash memory – good for about 30 minutes of playback time at the lowest compression level. Adding a 128MB SmartMedia card can bolster storage, but this would have to be purchased separately.

The SM-320V feels comfortable with its grippy notches, matt black finish and light 62g mass (batteries not included). The layout is good, with the volume, repeat and voice record buttons all

located down the left side, and neatly recessed to prevent accidental presses. The play/pause, skip, and stop buttons are incorporated into a four-way pad for easy operation. The LCD displays the song title and track number, battery status and remaining time.

Once you have installed the D'Music Manager software, you're greeted with an Explorer-like screen. Three internal windows are present with the left and top right ones displaying the directory

structure and the contents of the folders on your PC. The bottom right window is where you drag and drop the MP3 files to start uploading.

Data transfer over the supplied parallel port cannot compare with the rates achieved by the USB players. In fact, this is the slowest player in our tests. It took 18 minutes 50 seconds to complete our large file (21.5MB) transfer test, and a sluggish 22 minutes 56 seconds to transfer six mixed files totalling 25.8MB.

Even though the unit can be used as a mini hard drive, a fair proportion of power from the two supplied AAA batteries will be spent during the lengthy uploading process. There is no support for wma files, however variable data rate is supported, but track times are not converted into real time.

As for sound quality, vocals are clear and crisp, but deeper tones lack punch. This can, however, be adjusted by selecting one of the five (pop, classic, jazz, ex-bass, flat) EQ modes. As for the recording function, the mic was quite sensitive and easily picked up voices from across our office.

This is a decent unit that won't break the bank. A pair of headphones, two AAA batteries, and a carrying pouch are thrown in for good measure.

DETAILS

★★★

PRICE £117.99 (£100.41 ex VAT)

CONTACT Pine Technology 01908 218 812

www.pine-dmusic.com

PROS Decent price and finish

CONS Extremely slow transfer rate; no support for wma files

OVERALL A light and good-value MP3 player, limited by its very slow parallel interface



S3 Rio 500



comes with 64MB – enough for a CD's worth of high-quality music or 23 hours of speech, and you can use SmartMedia cards (up to 64MB) to add more capacity.

The main unit (which comes in translucent teal, purple or grey) is much sleeker than the original Rio and features a large backlit screen that puts song titles and other relevant information at your disposal (thanks to support for the ID3 tag).

The multifunction dial provides an easy way of scrolling through your tracks, which can be separated into folders for ease of recall while the bookmark, EQ (bass and treble) and loop facilities all work pretty much as you'd expect.

Crucially, the USB connection makes it quick and easy to transfer MP3 files to the player and the bundled drag and drop Audio Manager software is some of the best on test (you can even use it to convert your CDs to MP3 format). Transferring our single large test file

DIAMOND WAS THE FIRST to market a solid-state MP3 player, the Rio PMP300, in 1998. Unfortunately, although the original Rio may have received praise for its technological innovation, the jet-black unit was fairly chunky, sound quality wasn't great and it certainly didn't come cheap.

The second-generation Rio 500 came a year later. This time, things were better. While the Rio struggled by with 32MB of onboard memory, the 500

took one minute 28 seconds, while our collection of six mixed files completed in one minute three seconds.

The Rio 500 (now sold by S3 following its purchase of Diamond) supports MP3, MPEG-2.5 and ADPCM file formats (and S3 promises you can update the firmware to take advantage of any new developments). Sound quality is great – even at high volumes – as the unit has a higher signal-to-noise ratio than most other players. Battery life is also good; you can expect about 13 hours from a single AA battery.

More than a year after its launch, the Rio 500 still holds its own – our only complaints would be the lack of a built-in microphone and FM radio.

DETAILS

★★★★★

PRICE £199.95 (£170 ex VAT)

CONTACT S3 01189 444 444

www.riohome.com

PROS Excellent sound quality; intuitive control system; good build quality; future Flash upgrades possible

CONS Still a little pricey; no microphone or FM radio

OVERALL A quality player although a little pricey



S3 Rio 600



500, after all, had double this amount of memory. Sadly, increasing this is not a simple matter of slipping a Compact Flash or SmartMedia card into the back – you have to buy one of S3's 32MB, 64MB or 340MB replacement backs, so if this is your player of choice you're pretty much tied into S3 for life.

It weighs just 68g without the single bundled AA battery or earphones. Stated playback time is over 10 hours on a single battery.

It supports MP3 files at bit rates of 16-320Kbits/sec and wma files. It does not have upgradable firmware, but S3 is working on a number of accessories that include a remote control with a built-in FM radio tuner.

Connection to the PC is via a USB cable. Playback modes include repetition of one or all tracks or random playback to save you getting bored of hearing the same old tracks in a familiar order again and again. The stylish oval

ONE OF THE BEST looking players around, the Rio 600 has snap-on-and-off covers, so you can change the colour if you fancy. These covers are available in packs of three and will soon be sold individually.

As standard the Rio comes with 32MB of memory installed, which S3 claims will be more than enough to handle an hour of music or 16 hours of the spoken word. We can't help thinking this is terribly stingy, though. The Rio

display is clear and easy to read, giving track and positional information.

In our tests the Rio performed very well, transferring our single large test file in just one minute and one second, a time that was only beaten by the Cybercomp MPGenie and the two Sony products. Its performance was equally impressive when it came to downloading the six mixed files, although at one minute and 20 seconds it was beaten by its older sibling, the Rio 500, by 17 seconds.

The lack of memory is an irritation, and as the upgrades are proprietary, you are a little bit railroaded with this device. It's hard to know why S3 has gone this route when the Rio 500 is only an extra £30 and doesn't suffer the ailments of its numerically superior sibling.

DETAILS

★★★★★

PRICE £169 (£143.83 ex VAT)

CONTACT S3 01189 444 444

www.riohome.com

PROS Good looking; clear display

CONS Proprietary memory upgrade system; stingy memory allocation

OVERALL A great device, but the irregular upgrade route may be enough to put off many

Samsung SGH-M100



THIS PLAYER IS UNIQUE in this group test: it is the only one that is also a fully functional dual-band GSM phone. The phone has an infra-red modem, an active flip, vibrating alert and space for 99 numbers. Unfortunately, there's no T9 predictive text support. It is a very light and nifty little unit, sporting a small but easy-to-read display with a bright green backlight. There is 32MB of memory inside the phone, but this cannot be upgraded. The M100 will

play both MP3 and wma files.

The supplied headphones, which also double as a hands-free microphone and earpiece, are fairly good, and the M100 pumps out a decent enough sound. When calls come in, the music stops and you use the remote control to answer. You can control the player using this remote or buttons on the side of the phone. There's a hold switch on the remote to prevent accidental bumps

altering the settings. You can repeat the tracks, or specify points in each track to repeat over and over. Using the top selector buttons on the phone you can choose between six preset equalisation settings.

File transfer is through the parallel port, but we would prefer to see USB for increased speed. Transfer times are among of the slowest here, at five minutes 10 seconds for a 25.8MB file. It is far from being the slowest, though.

The supplied MP3 manager software is simple to pick up. Using this, you manage the files that sit in the phone's memory. The interface is just like Windows Explorer, so anyone familiar with Windows should have no problems picking it up. At the end of the day, it is just a transfer program, though. We would much prefer to see a full encoder included with the package.

The lithium-ion battery is quoted to last up to 60 hours on standby, although playing music when you're not talking will obviously drain the battery faster. The M100 is not the best solid-state music player here by any means, but it does have a decent GSM phone attached to it.

DETAILS

★★★

PRICE £349.99 (£297.86 ex VAT)

CONTACT Virgin Mobile 0845 6000 600

www.virginmobile.com/mobile

PROS Good headphones; easy to use; plays wma files

CONS Only 32MB of memory that cannot be upgraded; no encoder

OVERALL It's an interesting technology showpiece, but it'll only suit those who go for gimmicks

Sensory Science MP2300



IF YOU LIKE YOUR music players boxy then this is definitely the one to go for. You could never call it attractive, but there's a far more important reason to buy it – cheap storage. Turning its back on conventional solid-state media, the MP2300 (sold as Logix 2000 MPClik! by mp3players) instead swallows lomega's After Eight-sized Clik! disks whole, giving you 40MB at around £7 a pop, making it way cheaper than the alternatives. Two are bundled to get you going.

The excellent menu system partly makes up for the bland casing. Icons represent everything from playing audio, to retrieving contacts – yes, it's a basic organiser, too, synchronising with Outlook. You'll find the usual collection of headphone and data ports, each capped by a rubber bung. On the front there's a small microphone, for recording up to two and a half hours of your witty banter on a single disk.

The battery, meanwhile, promises to stretch to 12 hours on a single charge.

MP3 and wma formats are supported, and the firmware can be upgraded to take emerging standards into account.

MusicMatch is bundled for audio ripping, but the Digital Media Manager, used to upload to the player (or 'download' as Sensory Science puts it) is clunky and best avoided. A real bonus, though, is that the bundled lomega drivers

mount the device as a removable drive so we switched to dragging our MP3 files from the desktop to the player instead. Using either method, our three test files transferred in 17 seconds, a single 21.5MB file completed its journey in 46 seconds and a batch of mixed bit rate tunes, adding up to 25.8MB, took just under a minute – a respectable performance. Played back through the bundled earphones, the files featured all the characteristics of highly compressed music, but were no worse than anything else we've heard.

It's an ugly duckling as far as music players go, but then you'll keep it in a bag or coat pocket anyway. It has a long battery life, a first-class menu and the cheapest storage going. In short, we're fairly impressed.

DETAILS

★★★

PRICE £229.95 (£195.70 ex VAT)

CONTACT MP3 Players 01753 570 800

www.mp3players.co.uk

PROS Cheap storage; speedy transfers; good menu system; mounts as a drive

CONS Ugly; disappointing upload software (which loses it a star)

OVERALL If looks are unimportant then it's certainly one to consider

Sony NW-E3 Network Walkman



memory cards, instead it ships with 64MB of solid-state memory built in that cannot be augmented. Although some may see this as a severe limitation, that's not necessarily the case. Considering a 64MB memory card will set you back around £120 inc VAT it's likely most users will reuse the memory card that comes with their player. The lack of removable media is what makes the NW-E3 as small, light and stylish as it is.

Unlike the Memory Stick Walkman, which has

a thumb-activated jog dial to control things, the Network Walkman has a twisting controller mounted to one end, similar to the remote controls that Sony ships with its MiniDisc Walkmans. It's easy to control, with a twist to the right skipping forward and a twist to the left skipping backward, while pressing the top either plays or stops.

Sony has once again snubbed MP3 in favour of its own compression algorithm ATRAC. This is no bad thing since the

sound quality from ATRAC (Adaptive Transform Acoustic Coding) is generally superior to MP3, although it does mean that if you have a library of MP3 files you'll have to convert them to ATRAC before you can play them. When ripping tracks from a CD the sound quality is nothing short of superb. Obviously you can choose the quality level, with lower quality using less memory and high quality using more. Choosing the middle quality preset produced excellent sound.

Transfer times were incredibly fast so you're not going to be hanging around waiting to get your music on board.

The NW-E3 is stunning – smaller and lighter than any other portable music device. You can even turn the display into a spectrum analyser – now that's cool.

THERE'S NO DOUBT that the Memory Stick Walkman (see later) is cool, but compared to the Network Walkman it could almost be described as boring.

This little silver wonder weighs in at an unbelievable 45g including the AAA battery and it's no exaggeration to say that you can't even feel it in your pocket. Finished in brushed silver, the NW-E3 looks every bit the futuristic device it is.

Unlike the majority of devices on test, the NW-E3 doesn't use removable

DETAILS

★★★★★

PRICE £249 (£211.91 ex VAT)

CONTACT Sony 08705 111 999

www.sony.co.uk

PROS Small, stylish and light. Very fast file transfers and great sound quality

CONS Some may be put off by lack of removable storage

OVERALL A stunning product. It's easy to see that Sony invented the mobile music player



Get downloading with our pick of the pops

So you've taken the plunge and invested in your first solid-state music player. That's no good, though, if you've got nothing to listen to. You could rip your CDs and transfer them or you could scour the Internet for something new. Here's PCW's pick of the top three sites to find online audio.

First off is www.peoplesound.com, which has an interesting take on the whole idea of downloading music for your solid-state player. There's no way you're going to be able to legally download the likes of Madonna and Radiohead, so why not download the soundalikes instead? Its intelligent search engine allows you to enter the name of an artist you like – say Steps – and it'll bring up a list of similar bands whose music it stores for you to download. Just like the best Internet search engines, it rates the hits by percentage, so you know that a 90 per cent rating sounds more like your choice than one that scores



For soundalikes go to peoplesound.com

only 55. Click on the names of the artists it turns up for a short description of themselves and their music.

Perhaps the most famous of all the music download sites is www.mp3.com, which looks far more like a standard Internet engine along the lines of Yahoo or Excite. More than just a music resource, it's also

home to a regularly updated selection of related news stories, and themed sections tie your downloads into the time of year. We checked it out at the end of October when it was running a special Halloween section.

If you'd rather hear Radio Four than Radio One, then check out www.mp3lit.com for perhaps the biggest selection of



Steve Martin a novelist? Check it out at MP3Lit

spoken word on the net. Sitting on the servers of online supermag *Salon*, it's a haven for book fans everywhere, with samples and extracts from the latest literary releases and direct links to the sites that sell them. It was here that we first learnt comedian Steve Martin had written a novella, which we found on our way to download some Harry Potter.

NIK RAWLINSON

Sony NW-MS7 MS Walkman



used in the MiniDisc arena and uses less compression than MP3, resulting in superior sound quality. So, if you want to play MP3 files you'll have to convert them to ATRAC first. Of course, doing this won't give you the quality advantage, but ripping a CD to ATRAC sounds superb on this player.

In the box you get a power supply, a USB cable and a small docking bar. Both the power supply and cable plug into the docking bar so

when the Walkman plugs into the bar it's charging its battery and connecting to the PC simultaneously.

The NW-MS7 is very light at 70g, but not as light as its sibling the Network Walkman. But the advantage of this unit is its ability to use multiple Memory Sticks. Whether you will make use of this depends on how much cash you have, since a second 64MB Memory Stick will set you back around £116 inc VAT. And don't get any ideas about using Memory

WE LOOKED AT THE Memory Stick Walkman a few months ago and, although we liked it, we didn't think it quite lived up to the high standards Sony had set for itself when it came to portable audio. That said, the NW-MS7 is still a cut above the majority of the other products on test.

Sony decided that the MP3 standard wasn't good enough for its solid-state Walkmans, so instead implemented the ATRAC system. This is already widely

Sticks from your digital camera because you need the white Magic Gate Memory Sticks rather than the purple ones.

Control is simple, with the jog dial dealing with the main functions and separate buttons for stop and volume.

The sound from the headphones is very good and the supplied extension cable make them long enough for even the tallest of listeners.

Transfer-wise, the MS Walkman was fast, but not as fast as the Network Walkman. That said, you're not going to be twiddling your thumbs for too long.

On the whole this is an impressive product, but if you're not bothered about removable memory, the smaller and cheaper Network Walkman is a better bet.

DETAILS

★★★★

PRICE £299 (£254.46 ex VAT)

CONTACT Sony 08705 111 999

www.sony.co.uk

PROS Small, light and fairly fast transfer rate

CONS Larger, heavier and more expensive than the Network Walkman

OVERALL A stylish and high-quality product, but Sony's own Network Walkman is more desirable

Vivanco Vmax



that is easy to use but exposed to interference from the elements. A second volume control sits on the headphone lead and secures to your clothing at lapel level.

There are three bass settings, but we found that they all sounded pretty much the same. Inevitably the price of such a small player means that there is no chance of fitting on a display and no way of knowing which track you are playing.

The Vmax comes with

32MB of memory in the shape of two 16MB MultiMedia Cards (MMCs). A disadvantage here is that the MP3 files cannot be split – you need to have two neat 16MB chunks to take full advantage of the memory. On the plus side, it means you can upgrade one card without discarding the other.

An attractive, frosted-plastic unit is used for reading and writing to the MMCs. In our tests it performed fairly poorly, with the single large file

THE VMAX IS INCREDIBLY small and manages to squeeze in all the basic features you'd require of a personal MP3 player.

It is little bigger than a box of matches and even with single AAA battery it only weighs in at 30g. Simplicity is maintained in terms of the controls, too. Down one side you'll find just three buttons, for playback and searching through tracks. The volume control is a circular dial on the front,

transferring in three minutes 22 seconds and the collection of six test files completing their journey in just a second under four minutes. This result is disappointing since it connects to the PC via the USB port.

In terms of software, Pontis LED does little more than allow you to build playlists, write them to the MMCs and change the ID3 tag. You also get eJay MP3 Station, which is one of the most straightforward pieces of software for copying CDs and ripping MP3 and wav files, if not very advanced.

If you want a feature-packed MP3 player then look away. The Vmax is easy to use but due to its incredibly small size only manages the most basic functions to a very basic level.

DETAILS

★★★

PRICE £176.25 (£150 ex VAT)

CONTACT Vivanco 01442 403 020

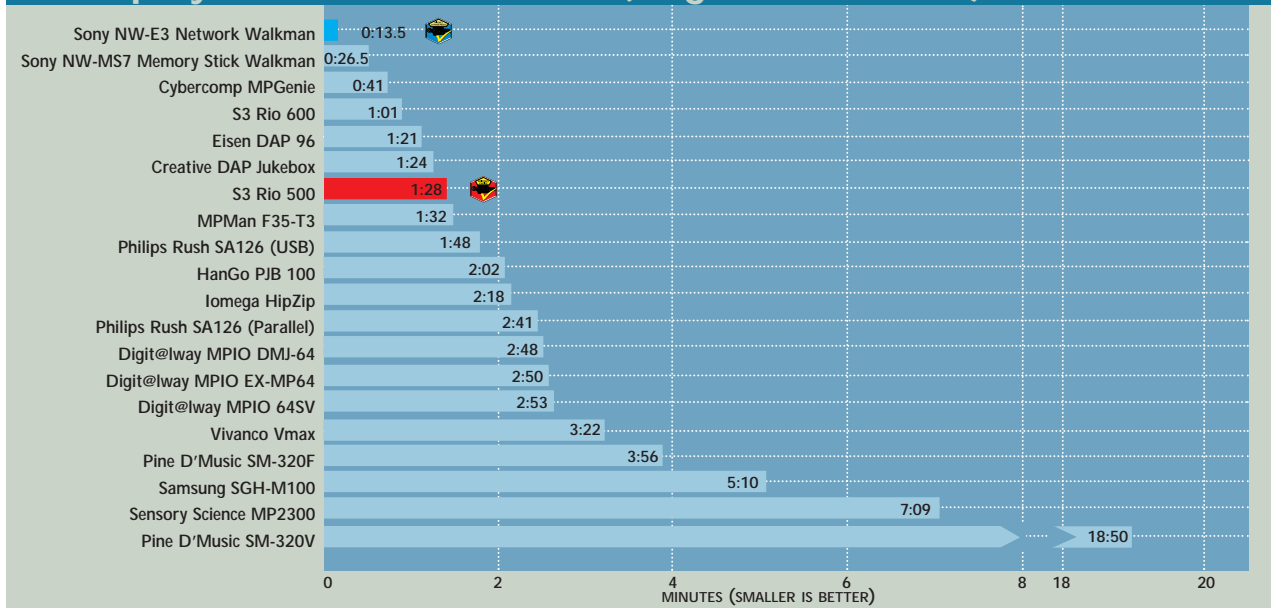
www.vivanco.com

PROS Very small; light; separate MMC slots; cheap

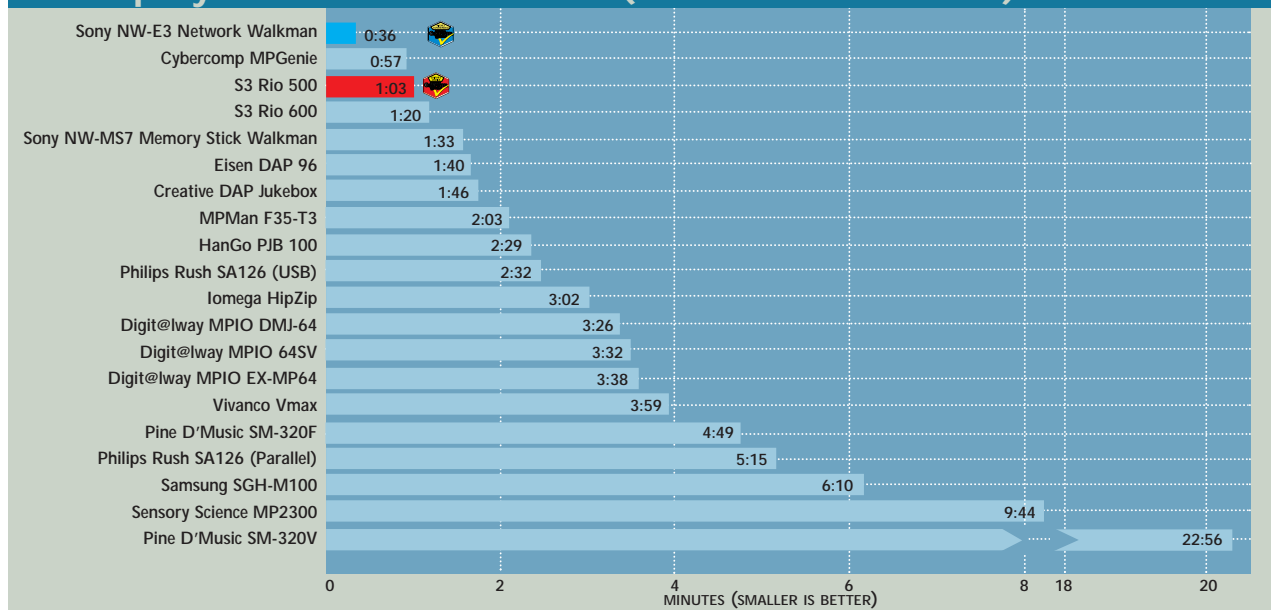
CONS Very basic controls; no display

OVERALL For its size, feature-packed and flexible but real connoisseurs will be left wanting more

MP3 players download times (large file transfer)



MP3 players download times (transfer of six files)



How we did the tests

One of the key usability considerations for solid-state music players is download speeds. This is one of the easiest tests to perform and it gives a clear benchmark by which players can be compared.

We installed the software shipped with each player and connected them up using the supplied parallel or USB cables. We created a single large 21.5MB MP3 file that was encoded at 320Kbits/sec.

We then transferred this using the supplied software (see top graph for results). Next, we took a sample of six mixed format songs to test the dynamic range of each device. These files made up a transfer size of 25.8MB. Each was encoded at 128Kbits/sec.

Two files were created using VBR (variable bit rate) format. This is meant to decrease the overall size of the files, but at the same time it can also decrease the audio

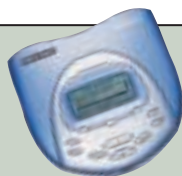
quality, since those parts of the song that have less going on are generally encoded at a lower bit rate. Finally, a wma (Windows Media Audio) file was generated to see which players supported this format.

None of the players (except those from Sony that use ATRAC compression and so were exempt) had any problems playing VBR-encoded MP3 files. That said, most were unable to display the correct time and/or file size

using their built-in LCDs. We were disappointed, however, that most of the players in this test didn't recognise the fairly new wma standard.

We listened to the playback quality of each player and compared it to the original MP3s stored on our reference machine fitted with a SoundBlaster Live! card. In every instance, we used the player's bundled headphones to listen to playback, as well as a further, higher quality set.

Table of features

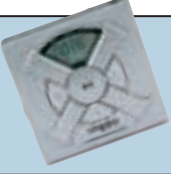













| MANUFACTURER | CREATIVE | CYBERCOMP | DIGIT@LWAY | DIGIT@LWAY |
|---------------------------|--|---|---|--|
| MODEL | DAP JUKEBOX | MPGENIE | MPIO 64SV | MPIO DMJ-64 |
| Price inc VAT (ex VAT)) | £349 (£297.02) | £219.95 (£187.19) | £199.95 (£170.17) | £189.95 (£161.66) |
| Telephone | 01189 344 744 | 01753 570 800 | 01753 570 800 | 01753 570 800 |
| URL | www.europe.creative.com | www.mp3players.co.uk | www.mp3players.co.uk | www.mp3players.co.uk |
| FEATURES | | | | |
| Memory | 6GB | 64MB | 64MB | 64MB |
| PC connection cable | USB | Parallel | Parallel | Parallel |
| Memory upgrade media | N/A | SmartMedia | SmartMedia | SmartMedia |
| Display | ✓ | ✓ | ✓ | ✓ |
| Backlight | ✓ | ✗ | ✗ | ✗ |
| Battery | 4 x AA rechargeable | 1 x AA | 2 x AAA | 1 x AA |
| Dimensions h x w x d (mm) | 127 x 127 x 38 | 81 x 60 x 19 | 90 x 66 x 18 | 62 x 68 x 17 |
| Weight (inc battery) | 435g | 80g | 95g | 78g |
| SOFTWARE | | | | |
| | Play Center 2 | MPGenie Manager v.2.5 | MPIO Desk | MPIO Desk |
| OTHER FEATURES | | | | |
| | AC adapter, carry pouch, line/out ports, headphones | AC adapter, can be used as a mini hard drive, carry pouch, headphones | Optional digital camera, digital voice recorder, FM radio, phone no storage, headphones, can be used as a mini hard drive | Digital voice recorder, telephone number storage, can be used as a mini hard drive, headphones |

Table of features (continued)



| MANUFACTURER | PINE | PINE | S3 |
|---------------------------|--|---|--|
| MODEL | D'Music SM-320F | D'Music SM-320V | Rio 500 |
| Price inc VAT (ex VAT) | £148.95 (£126.77) | £117.99 (£100.41) | £199.95 (£170) |
| Telephone | 01753 570 800 | 01908 218 812 | 01189 444 444 |
| URL | www.mp3players.co.uk | www.pine-dmusic.com | www.riohome.com |
| FEATURES | | | |
| Memory | 32MB | 32MB | 64MB |
| PC connection cable | Parallel | Parallel | USB |
| Memory upgrade media | SmartMedia | SmartMedia | SmartMedia |
| Display | ✓ | ✓ | ✓ |
| Backlight | ✗ | ✗ | ✓ |
| Battery | 2 x AAA | 2 x AAA | 1 x AA |
| Dimensions h x w x d (mm) | 85 x 62 x 18 | 85 x 63 x 17.5 | 90 x 60 x 17 |
| Weight (inc battery) | 72g | 72g | 100g |
| SOFTWARE | | | |
| | D'Music Manager | D'Music Manager | Audio Manager, Audible Mgr, Sonic Foundry Acid Style |
| OTHER FEATURES | | | |
| | Digital voice recorder, FM radio, can be used as a mini hard drive, headphones | Digital voice recorder, can be used as a mini hard drive, headphones, carry pouch | Can be used as a mini hard drive, headphones, storage case |

|  |  |  |  |  |  |
|--|---|---|---|--|---|
| DIGIT@LWAY | EISEN | HANGO | IOMEGA | MPMAN | PHILIPS |
| MPIO EX-MP64 | DAP 96 | PJB100 | HiP ZIP | F35-T3 | RUSH SA126 |
| £159.95 (€136.13) | £229.95 (€195.70) | £595 (€506.38) | £289.99 (€246.80) | £159.95 (€136.13) | £269 (€228.94) |
| 01753 570 800 | 01753 570 800 | 01425 480 838 | 01628 822444 | 01753 570 800 | 020 8665 6350 |
| www.mp3players.co.uk | www.mp3players.co.uk | www.pjbox.co.uk | www.iomega.com | www.mp3players.co.uk | www.rush.philips.com |
| 64MB | 96MB | 6GB | 80MB | 32MB | 64MB |
| Parallel | Parallel | USB | USB | USB | USB/Parallel |
| SmartMedia | SmartMedia | N/A | Pocket Zip disk | Flash Memory | SmartMedia |
| ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| ✗ | ✓ | ✗ | ✓ | ✗ | ✗ |
| 1 AA | 1 x AA | 1 x Li-Ion rechargeable | Built in | 1 x AA | 2 x AAA |
| 64 x 64 x 17 | 60 x 90 x 15 | 80 x 150 x 26 | 107 x 70 x 29 | 84 x 57.5 x 17.2 | 70.5 x 70.5 x 17.7 |
| 78g | 80g | 280g | 189g | 94g | 85g |
| MPIO Desk | DAP Manager, Music Match (trial), Nex Encode (shareware), Audio Catalyst (Trial) | Jukebox Manager | Music Match Jukebox | MPMan | Real Jukebox |
| Can be used as mini hard drive, headphones | Carry case, headphones | AC adapter, case and carry strap, headphones | Headphones, carry case, 2x PocketZip disks | Digital voice recorder, FM Radio, Headphone remote control | Headphones, carry case |

|  |  |  |  |  |  |
|---|---|---|---|--|---|
| S3 | SAMSUNG | SENSORY SCIENCE | SONY | SONY | VIVANCO |
| Rio 600 | SGH-M100 | MP2300 | NW-E3 NETWORK WALKMAN | NW-MS7 MEMORY STICK WALKMAN | VMAX |
| £169 (€143.83) | £349.99 (€297.86) | £229.95 (€195.70) | £249 (€211.91) | £299 (€254.46) | £176.25 (€150) |
| 01189 444 444 | 0845 6000 600 | 01753 570 800 | 08705 111 999 | 08705 111 999 | 01442 403 020 |
| www.riohome.com | www.virginmobile.com/mobile | www.mp3players.co.uk | www.sony.co.uk | www.sony.co.uk | www.vivanco.com |
| 32MB | 32MB | 40MB Cliq! Disks | 64MB | 64MB | 32MB (2 x 16MB) |
| USB | Parallel | USB | USB | USB | USB |
| Memory backpacks | N/A | N/A | N/A | Sony Memory Stick | MMC |
| ✓ | ✓ | ✓ | ✓ | ✓ | ✗ |
| ✓ | ✓ | ✓ | ✓ | ✓ | ✗ |
| 1 x AA | 1 x Li-Ion rechargeable | 1xLi-Ion rechargeable | 1 x AAA | Built in | 1 x AAA |
| 100 x 63 x 25 | 102 x 40 x 20 | 120 x 71 x 22 | 31.8 x 79.4 x 12.7 | 96.3 x 37 x 19.2 | 43 x 52 x 19 |
| 88g | 100g | 198g | 45g | 70g | 30g |
| Rio Audio Manager | Samsung MP3 manager, Easy GSM | Digital Media Manager, Music Match | OpenMG Jukebox Music Management v1.2 | OpenMG Jukebox Music Management v1.2 | eJay MP3 Station, Pontis LED |
| Headphones | Dual Band Phone, combined hands-free headphones, infra-red modem, 99 number capacity, active flip | AC adapter, headphones, 2 x 40MB disks | Headphones, carry pouch | Headphones and extension kit, carry pouch, AC power adapter | MMC USB card reader, remote headphones |



Editor's Choice

The popularity of the MP3 format has grown rapidly. In fact it wasn't that long ago when the portable MP3 player didn't even exist. However, as indicated by the variety and number of players in this group test alone, the market is obviously buoyant. The main reason for the success of these devices is the MP3 (MPEG Audio Layer 3) format itself. Why? Well it is a question of size. Not so much the age old adage of bigger is better, but quite the opposite – MP3 files are small. Putting it simply, if you were to rip a five-minute track from a CD, around 50MB of memory would be required to store it. That's a fair chunk of space, making downloads and uploads quite tiresome. However, by applying MP3 compression this figure can be whittled down to a more manageable 3MB – achieved by encoding the data so that sounds inaudible to the human ear are eliminated. The MP3 format is not the only compression technique out there and another is Sony's own ATRAC (Adaptive Transform Acoustic Coding) compression system, first developed for the MiniDisc.

With one track taking up around 3MB it's quite clear that to make a solid-state player desirable, memory must be a key feature. Indeed, this aspect of a player has been widely represented in this group test, from built-in Flash memory and SmartMedia cards to Sony's Memory Stick, MMC cards, Iomega's Klik! or PocketZip disks, and even 6GB hard drives. Some memory types have advantages over others. For instance, with solid-state memory you have no moving

parts – ideal for skip-free listening while you are exercising in the gym.

Memory isn't the only reason these devices are so desirable. With portability in mind size matters again, but this time it's physical. The idea of music on the go is a winner, already demonstrated by the Sony Walkman. But, make the device too large and you're more than likely going to leave it at home.

So taking into account the above features we asked ourselves, 'what makes a solid-state music player a good solid-state music player?' Well, while a lot of it comes down to personal preference in terms of style and size, other factors such as sound quality, performance and cost are just as important and we considered those in depth too.

The winners

As there were plenty of contenders – many of good quality – choosing the best was a tricky decision. To narrow it down a little we decided that a winning device should be able to carry at least 64MB worth of music (without memory upgrades), thus allowing us to eliminate those players with just 32MB of storage. These are not necessarily bad devices, but ones that, straight out of the box, we felt were limited.

With 13 remaining there has to be a winner and after considerable debate, the **Editor's Choice** award goes to **S3's Rio 500**, as it was the best all-rounder. Sporting 64MB of onboard memory (expandable to 128MB with a 64MB SmartMedia card), the Rio 500 was no slouch thanks to its USB connection, coming well above average in both of our

file transfer tests (see How we did the tests and graphs on page 235). In addition, it delivered excellent sound quality at elevated volume levels, while impressively squeezing out 13 hours of playback from just one AA battery. The Rio 500's firmware can also be updated, future-proofing it for any new developments. It isn't a bad looker either, with a sleek design and intuitive controls, all topped off with an excellent backlit display – ideal if you're out and about on those dark winter evenings. The supplied Audio Manager software is one of our favourites, and although we'd like to see it a little cheaper, at £199.95 inc VAT, the Rio 500 is the cheapest 64MB, USB-enabled player on test.

We decided to give out only one **Highly Commended** award this time because there was one device that we felt shone out from a very mixed bag of runners-up. The winner was **Sony's NW-E3 Network Walkman** because the *PCW* team felt it was the embodiment of what a solid-state music player should be – small and light. It also looked and behaved the part, with its brushed silver finish, nifty display and file transfer times that were the best on test here. Why didn't it get the Editor's Choice? Well it was close but we felt that some users may be put off by the lack of removable storage and if you have a library of MP3s these would have to be converted to ATRAC before you could listen to them. It also costs £49 more than the Rio 500.

As it's Christmas we thought we might mention one other player – the Creative DAP Jukebox. We just couldn't agree whether we liked it or not, so the office remained split right down the middle. What we can say is that at over £240 cheaper than the similarly specced HanGo PJB100, this is the player to go for if you want to store your entire, or at least a good portion, of your CD collection into one portable audio.

Before you dash out thinking that buying a solid-state music device is a quick and easy way to copy your mates' CD collections, bear in mind the legal implications. The law is rather grey at the moment and most people will not be able to tell you for definite whether or not you'll get in trouble if you rip your own music in the UK. Keep an eye on the ever-changing law and keep yourself out of trouble. The music industry and the rules that govern it move fast.



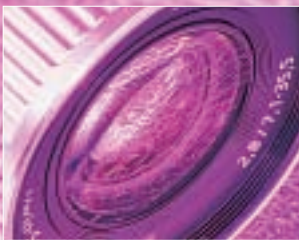
S3's Rio 500 was the best all-rounder, with 64MB of memory and speedy transfer rates



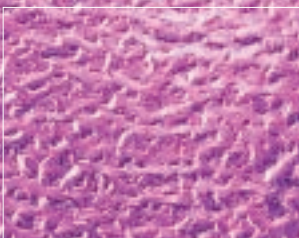
Sony's Network Walkman is just what an MP3 player should be – small and light

pcwexpert

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Cameras have a long and distinguished history, dating from the times of Aristotle and Leonardo da Vinci. This month's pcwexpert brings digital cameras into focus. We investigate their technology and future, while our workshops help you get the best results from your camera

PHOTOGRAPH PATRICK LLEWELYN-DAVIES

digital cameras

Written by Gordon Laing

Snapshots in the development of the camera

From the days of the *camera obscura* to the digital technology of today, photography has certainly come a long way

Cameras are such an integral part of the modern world that, like other technological innovations, it's difficult to imagine life without them. But when were they invented? And how did their evolution bring us to the digital models of today?

Unlike the chicken and the egg, the camera came before the film. We can trace its origins back to the *camera obscura*, which is Latin for 'dark room'. A *camera obscura* is simply a darkened room or box, with a very small hole at one end. If the hole is sufficiently small, light will pass through it and project an inverted image on the opposite wall. This technology was known about at the time of Aristotle. The first practical application can be traced back to an Arabian scholar in the 10th Century, who used a similar method to observe solar eclipses.

The first recorded application of using a *camera obscura* is down to Leonardo da Vinci, who in 1519 advocated it as an aid to drawing. The artist would sit inside a room-sized *camera obscura* and literally trace the projected image for an accurate reproduction. The optical concept was proven, but for the camera to arrive as we know it

today, a light-sensitive material had to be placed inside it, rather than an artist with a set of brushes.

Over the following 400 years, numerous people discovered that various materials were sensitive to light, changing colour when exposed for any length of time.

During the early 1800s, several significant advances were made, including William Henry Fox Talbot's Calotype process in 1839, which reduced exposures from hours to minutes. In the same year, Sir John Herschel coined the term 'photography', derived from the Greek for 'light' and 'writing'. By 1884, George

Eastman had produced the first flexible film, by putting light-sensitive material onto a celluloid backing. Four years later he put the film in the first Kodak camera and launched his product with the slogan: 'You push the button - we do the rest.'

To this day, Kodak continues to dominate photographic innovation, from the Box Brownie through the Instamatic and disc cameras, to PhotoCD and the first digital cameras. Apple may have branded the first true consumer digital camera in 1994, but it was a development with Kodak, which had already produced a 1.3megapixel Pro Model three years earlier.

As with all aspects of technology, the past few years have seen quality increase and prices drop. The very latest breed of digital cameras are able to create good-looking 10 x 8in prints on relatively cheap inkjet printers that will rival most film-based solutions.

Digital prices are still higher

than most film cameras for comparable quality and, for the moment, you really do need your own PC and printer to get the most out of them. Then again, the ability to take a picture and immediately see and use it without developing can be pretty exciting. Couple this with memory cards that can be re-used again and again, and you've got a compelling photographic system that could easily convert many snappers to the joys of digital.

Digital principles

Digital cameras share plenty of principles with their film-based counterparts. A lens focuses reflected light from the subject onto a sensor that then stores the image for later processing. In the case of a film camera, the photo-sensitive emulsion of the film itself is both a sensor and a storage medium. After chemical processing, the film loses its light-sensitivity and subsequently can be stored and used for producing a photographic print.

Digital cameras employ similar optics to conventional cameras, but instead of film, there's an electronic chip at the back. The chip typically has a rectangular surface about the size of a small postage



pcwexpert timeline

| 1519 | 1839 | 1839 | 1888 | 1900 | 1972 |
|---|---|--|--|--|--|
| | | | | | |
| The <i>camera obscura</i> , Latin for 'dark room', was known about since Aristotle. First used by Leonardo da Vinci in 1519 as an aid to drawing. | Sir John Herschel first uses the term 'photography' from the Greek for 'light' and 'writing'. The first picture taken on glass was of his father's telescope. | William Henry Fox Talbot discovers the 'latent image' phenomenon which reduced exposures from one hour to less than three minutes. | George Eastman launches the Kodak brand with the first film camera. The slogan 'You push the button - we do the rest' was Eastman's own. | The first Kodak Box Brownie was introduced. It sold for \$1 and used film at 15c a roll. Photography was now within the reach of the masses. | Kodak Instamatic camera using new 110 format film cartridge. More than 25 million were produced in less than three years with global sales of \$4bn. |

stamp and is packed full of many light-sensitive elements. The more of these elements that are squeezed on the chip's surface, the greater the level of detail.

Once the chip has been exposed, the light information from the elements is turned into digital data that is then stored in computer memory. Unlike film, this memory doesn't require any chemical processing to reveal the image, and it can also be re-used. Consequently, digital photographers can view their pictures immediately, decide whether to keep them or not, and once copied onto the safety of, say, a PC, can wipe the memory clean and start snapping again.

On display

The killer application for digital cameras is their ability to immediately view an image and check to see if it's all right. They do this by fitting a small colour LCD screen on the rear, which can be used for image composition. Most cameras are fitted with screens that measure either 1.8in or 2in across the diagonal – it may not sound like much, but in practice the 2in screens feel much bigger.

The screens will display only a few hundred dots in either direction, but most cameras allow you to zoom in on a picture and scroll around during playback. Modest camera models offer a mere 2x enlargement, while better ones boast up to 5x.

When digital cameras first arrived, however, many people criticised their screens for eating battery life at a rate of knots. Consequently, most digital cameras also feature optical viewfinders, which can prove invaluable when bright sunlight renders the display unusable. It is, however, worth pointing out that screens aren't as evil as many thought, as switching them off normally only saves a little power. The fact is that the electronic nature of digital cameras makes them power-hungry devices.

The power within

Which leads us onto the subject of batteries. Power sources for digital cameras essentially fall into two camps: those that use conventional AA batteries and



those that opt for often proprietary lithium-ion rechargeables. But while AA models can accept normal disposable alkaline cells, you should only use them in an emergency as you'll normally get only an hour's use.

When it comes to recharging, big differences emerge between AA and the proprietary lithium ions. A set of NiMH AA rechargeables will take about 12 hours to completely refill,

compared to an hour or so with a lithium ion. Such proprietary lithium ions are also smaller, lighter and generally more forgiving on topping up when not completely discharged. On the downside, a spare may cost you up to £50 and only be available from specialist dealers, whereas it's hard to find a shop that doesn't have cheap AAs on sale.

Either way, ensure you do carry spares or can recharge every night as the average lifespan of digital camera batteries is normally less than two hours of solid use, which translates into a reasonable day's photography.

This is one crucial area where film cameras still lead the way.









Digital versus film - the pros and cons

DIGITAL CAMERA

- No film to develop
- Can see pictures immediately
- Don't have to finish 'roll'
- Pictures already digital
- Memory cards can be re-used
- Memory cards expensive
- PC essential for image storage
- You really need your own printer
- Digital cameras are expensive
- Batteries drain quickly

FILM CAMERA

- Must develop film
- Must wait for developing
- Usually finish film before seeing pictures
- Need scanner to get pictures into a PC
- Film can only be used once
- Film is cheap and widely available
- No need for a PC
- You get prints back after developing
- Film cameras are cheap
- Batteries last a long time

| 1990 | 1991 | 1994 | 1995 | 1997 | 2000 |
|--|--|---|---|--|---|
|  |  |  |  |  |  |
| Kodak announces development of its PhotoCD format. Stores 100 scanned 35mm images at five different resolutions. Optional player connects to TV. | Kodak DCS 100 (left): first pro digital camera. Based on a modified Nikon F3 with 1.3megapixel CCD. Images stored in separate box with 4in screen. | Apple QuickTake 100, first consumer digital camera launched at Tokyo MacWorld Expo. Arrives in UK in 1995 at £599, storing eight 640 x 480pixel images. | Kodak's DC 40 is first fully featured consumer digital camera. Priced at £895, the 1lb camera boasts 756 x 504pixel resolution, and stores up to 48 images. | Hitachi's MPEG-1, the world's first single-chip CODEC LSI, can record and compress up to 20 mins of video onto 260MB PC Card hard disks. (PCW Mar 1997). | Canon's PowerShot S20, first of several 3.3megapixel cameras. Quality and control of new models is starting to rival film cameras. (PCW June 2000). |

Digital cameras in focus

Camera-shy? Or just baffled by the jargon? There's no need to be with PCW's guide to making the most of your digital 'toy'

A camera is essentially just a light-proof box in which to house a sensor – ask any photographer what the most important part of their system is and they'll always say it's the lens. So long as you've got a high-quality lens, you're well on the way to getting a great-looking photo, and this equally applies to digital cameras.

Different lenses, obviously, produce different effects. Typically these are to do with field of view, or literally the amount of stuff you can squeeze into the picture. With the photographer standing still, a lens with a wider focal length will capture a broader field of view than a lens with a longer focal length, but there are additional properties.

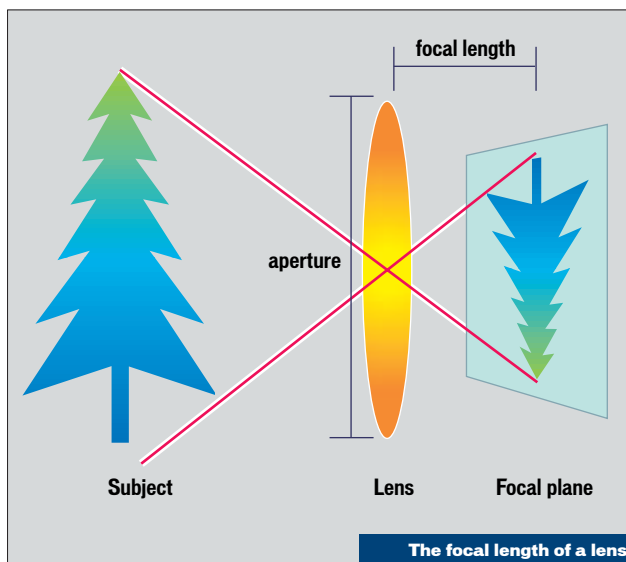
A wide lens typically features a greater depth of field, where more subjects, both near and far appear to be in focus – so it is not so critical to get the focus spot on. The longer a lens, however, the smaller its depth of field, and hence fewer subjects, near and far, that are in focus.

Lens aperture techniques, which we'll cover later, can adjust the depth of field in an image but the above rules are a good start.

Focal length

Photographic lenses are described by their focal length and focal ratio, the former measured in millimetres. Most 35mm film cameras are supplied with so-called standard 50mm focal-length lenses. These are called standard as they appear to match the magnification of human vision, although not its field of coverage – due to the size of 35mm film, a 50mm lens only squeezes in a 46 degree coverage across the film diagonal, compared to the almost 180 degrees of human vision.

If a 50mm focal length matches the magnification of human vision, then anything smaller will squeeze in a broader field of view. Popular wide-angle



The focal length of a lens

lenses include 28mm and 35mm focal lengths, while more specialist ultra-wide lenses are available below 20mm (itself boasting 94 degrees across the film diagonal).

Portrait photographers tend to prefer longer lenses with focal lengths of around 85mm (28.5 degrees) or 135mm (18 degrees), while wildlife photographers who can't get anywhere near their camera-shy subjects could use 500mm (five degrees) lenses or longer still. Astronomers wanting to take pictures of distant planets or lunar craters may be working at effective focal lengths of thousands or even tens of thousands of mm – the Sun and Moon are only half a degree wide, while the planet Mars is only around 120th of a degree across when it's closest to Earth.

In the most simple terms, the focal length of a lens is also the distance between it and the sensor or film. Clearly, with camera bodies frequently over 1in thick, most wide lenses would be impossibly small, while long lenses would quickly become too cumbersome. Fortunately, today's photographic lenses have groups of separate moving elements to produce the desired focal length with the minimum of

distortion in a compact package. Long lenses with barrels shorter than their focal length are described as being 'telephoto'.

Focal ratio

The second vital statistic of a lens is its focal ratio – described as the 'f' number. This is the ratio

between the focal length and the diameter of the objective lens element, known as the aperture.

The bigger the aperture, the more light the lens can capture, and therefore the better it will operate in dim conditions or those where fast exposures are desirable. The bigger the aperture, the smaller the focal ratio. For example, the typical 50mm lens sold with most 35mm cameras has a focal ratio of f1.8. This results in a maximum aperture of 50mm divided by 1.8mm, which equals 27.7mm, compared to the 41.6mm aperture of, say, a 50mm f1.2 lens.

Focal ratios are used to describe the brightness of a lens, as they are interchangeable at different focal lengths. A 50mm f2.0 lens is the same brightness as a 300mm f2.0 lens, and therefore requires the same exposure. However, as the focal lengths of lenses get longer, their apertures have to increase to maintain the same focal ratios. This makes them both expensive and

Digital Print Order Format

Today's digital camera users really need to have a PC with which to store, manipulate and finally print their images. However, an increasing number of printers are arriving with memory card slots, while more and more traditional photo-processing labs are offering direct printing from memory cards. But without using a PC, how do you state which pictures you want printing, not to mention actually finding them on the card?

The answer is the Digital Print Order Format (DPOF), invented by Canon, Kodak, Fujifilm and Panasonic back in October 1998.

DPOF is a standard for describing where images should be stored on a memory card and how a camera can mark them for subsequent printing.

The latest version DPOF 1.10 announced in July 2000, additionally allows images to be marked for multiple prints at specific sizes, along with supporting automatic slideshow options or transfer via fax or email – after all it's not just photo printers that could be equipped with memory card slots in the future.

www.panasonic.co.jp/avc/video/dpof/dpof_110/

cumbersome, which is why you normally only see, say, 500mm f4.0 lenses (with 125mm apertures) used by wealthy sports photographers – the rest of us can normally only afford the dimmer, but lighter and cheaper 500mm f8 models (with a 62.5mm aperture).

Due to their handling conditions, many photographers refer to lenses with small focal ratios and large apertures as being 'fast', while those with larger focal ratios and smaller apertures as being 'slow'.

Coverage

You'd be forgiven for thinking that a 50mm lens will produce a natural-looking picture regardless of what you put behind it. The reality, however, is tied into the actual size of the sensor behind the lens, and a 50mm focal length only offers a 46-degree field of view if you put a frame of 35mm film behind it. A full frame of 35mm film measures 24 x 36mm. Incidentally, the 35mm measurement refers not to the frame or diagonal, but the actual vertical measurement of the film format, which includes the 24mm frame height, along with the sprockets on either side – the frame diagonal of 35mm actually measures around 43mm.

If you were to place a larger sensor behind a 50mm focal length lens, such as 6 x 6cm medium format film, you'd naturally capture a wider field of view than with 35mm film. That's why a 50mm lens is considered wide angle to medium format photographers, and something nearer 80mm is standard.

Conversely, if you place a smaller sensor behind the same lens, you'll capture a more modest field of view.

Take APS film, for example, the frames of which measure 16 x 28mm. A so-called standard lens on this format would measure around 35mm in focal length, with the good old 50mm lens offering slight close-ups.

The imaging chips used by most 2.1 megapixel digital cameras measure a mere 0.5in on their diagonal, while those on most 3.3 megapixel models are

only slightly larger at 1/1.8in. Clearly to match the field of view of film cameras, the focal lengths of digital camera lenses must be much smaller.

Believe it or not, the average focal length of a typical three-times zoom lens on a digital camera is 7-21mm. Such short focal lengths are used to approximately match the field of view offered by typical film cameras.

In fact, since so many people understand what they're getting with 35mm film camera lenses, the manufacturers of digital cameras describe them as having lenses equivalent to this popular format. Consequently, an actual 7-21mm digital camera lens will be described as being equivalent to, say, 34-102mm on a 35mm film camera. Note that several digital cameras have optional focal reducers or teleconverters that screw on to the end to widen or lengthen the focal length.

It's worth mentioning briefly that professional digital SLR cameras are designed to use conventional 35mm lenses. Clearly with normal 0.5in imaging chips, most 35mm lenses would be transformed into long focal length monsters. Fortunately, Canon, Nikon and Fujifilm's pro cameras employ relatively large electronic sensors, typically measuring 15 x 23mm. They're not as big as frames of film, but only end up multiplying the effective focal length of 35mm lenses by around 1.5 times.

Remember that focal ratios still count on digital camera lenses. A 7mm f2.0 lens may only have a 3.5mm maximum aperture, but it's still the same brightness as any other f2.0 lens, and brighter than any f2.8 or f4.0 lens. If you're into taking pictures in dim environments or require the shortest exposures to capture fast action, then it's well worth considering a camera with as small a focal ratio as you can afford. While it's possible for an expensive zoom lens to maintain its focal ratio as you zoom in, normally the ratio decreases as the focal length increases. This is why a zoom lens will be described as having a focal ratio of f2-f2.5 or perhaps f2.5-f4, where the first

Making movies

More and more digital cameras are offering movie capture modes, but it's not time to throw away your camcorder just yet. Typically, you're looking at capturing somewhere between 15 and 60 seconds of modest resolution and slightly jerky video. Each generation of camera gets better at it though, with the latest boasting 320 x 240 pixel windows at 15 frames per second. It's certainly good enough to capture the feeling of an event, and is much less of a novelty than it may at first appear.

Most cameras save video files in the QuickTime mov format, which can be viewed using the software QuickTime player. Sony uniquely employs MPEG-1 compression, with its mpg files viewable in Microsoft's Media Player. You can also normally view these clips on your TV using the camera's video output. A 15-second video clip using best quality typically measures around 5MB.

Not all digital cameras capture sound with their movies. Those that do normally also let you record short audio clips to accompany an image – great when you're at an event and want to remember people's names.

number is the focal ratio at the widest focal length, and the second is the focal ratio at the longest focal length.

Exposure

Whether using film or an electronic chip, the camera's sensor can only record a limited range of tones from the very dark to the very bright.

Give it too little light and details will be undetectable in shadows, while too much light will saturate it to a point where detail in bright areas is lost forever.

Since 'real life' has a far higher range of shades and tones than film or an electronic sensor can ever hope to capture, the photographer has to make a subjective choice on which to record. The exposure controls the amount of light that reaches the camera's sensor and therefore which shades are captured.

Most cameras offer reflective metering, where the amount of light reflected from a subject is measured by a sensor and compared against tables of sensor sensitivity. At this point, the camera can make an exposure suggestion that would

place the subject somewhere in the middle of its acceptable tonal recording range. Clearly it pays to meter carefully, although many cameras take more than just the central portion of the composition into consideration, using intelligence to counteract tough scenes like snowscapes, shadowed canyons or even just sunlight reflected off a lake.

The photographer has two main ways to control the amount of light striking the camera's sensor during an exposure: aperture and shutter speed. The former places an iris at the back of the lens, adjusting the effective aperture diameter from wide open to just a tiny hole, while the latter uses an electronic or physical shutter to time how long the sensor is exposed for, typically in fractions of a second.

In addition, the actual sensitivity of a sensor can be increased for low-light circumstances by using 'faster' film or by increasing the 'gain' of an electronic chip. Both measure their sensitivity in units of ASA, with 100 ASA suitable for average conditions, 200 ASA twice as sensitive and 400 ASA twice that again. As film speed or chip gain

Today's digital camera users really need to have a PC to store, manipulate and print images

increases, quality is reduced with coarser grain or higher random noise speckles respectively.

Aperture

Closing the aperture does more than just letting in less light – it increases the depth of field, bringing more things into focus. Even though just your subject appears to be in focus through the viewfinder, reducing the aperture will increase the depth of field in the final photo, bringing objects behind and in front of the subject into focus too. Conversely, opening the aperture fully will only have your immediate subject in focus. A large depth of field can be desirable for a landscape image where you want both the distant hills and nearby trees in focus, while a small depth of field can look great on portraits where you want everything around the subject to be fuzzy.

Film camera lenses offer a multitude of aperture settings, designed to increase or decrease the exposure by double or half each step. Digital cameras typically have more limited aperture settings, leaving the photographer to essentially go for wide open (around f2.0 or f2.8) or fully closed (f8 or f11) – these should still, however, have the desired effect of small and large depths of field respectively.

Shutter speed

If you're closing the aperture, less light will pass through the lens, so you're going to need to expose

Closer than close

Taking photos of people and places is one thing, but if you're into particularly small subjects then you're going to need to get in close. Most cameras feature a macro mode, normally indicated by a small flower icon, which instructs the lens to focus as close as it can. While macro modes are essential for close-ups, be aware that some cameras do it better than others.

The closest focusing distance on a great many digital cameras is a mere 20cm, which simply isn't close enough to fill the frame with a small subject like a coin.

If you're into close-up photography, look for a camera that can focus at least as close as 5cm. Several now offer 4cm distances, while Nikon's CoolPIX 990 and Sony's Cyber-shot DSC-F505V both focus as close as 2cm (see Results pages later in this pcw expert for comparisons).



the sensor longer to compensate. This means using a longer shutter speed, and maybe even using a tripod or stable mounting to eliminate camera shake. If you're running low on light (whether it's for a totally closed aperture or nighttime shot) and have no tripod handy, try to rest your camera on a rock, ledge or fence to keep it steady.

Shutter speed does more than compensate for aperture settings, however. A fast shutter speed will freeze action, while a slower

shutter speed will blur it. Again, these can be used for artistic reasons, although don't necessarily choose the fastest shutter speed for action shots. Consider using a slower shutter speed while following a racing car in the viewfinder – since the car is kept relatively still in the frame, it will be sharp, but by moving the camera with a slow shutter speed, the wheels and background will blur, giving a better impression of motion.

The effect of shutter speed on

blurring depends massively on lens and conditions, but generally speaking, try to use at least 1/125 second for sharp handheld pictures, and between 1/8 and 1/30 second for blurring action. It is also possible to fire a flash with a relatively long exposure to combine both blurred motion and a sharp freeze – see the workshops that follow. The best thing to do is experiment until you get a result you like.

Compensation

Remember you don't have to trust the camera's built-in metering system. If you want a darker or brighter exposure than it's suggesting, then head for manual mode, or use exposure compensation settings (usually offered between -2 and +2 EV in 1/3 steps). To brighten a picture +1 EV brings out detail in pesky shadows, while -1 EV will darken a composition, perhaps suggesting a later time of day.

CCD

The most common imaging sensor used by digital cameras is called a Charge Coupled Device (CCD). A CCD consists of many light-sensitive elements. In the case of a scanner, the CCD features a single line of elements in a row, whereas in a digital camera, the CCD is a rectangular array of elements.

Each element on a CCD stores electrical charge proportional to the amount of light that has struck it. So, the brighter the light, the higher the charge stored. At the end of the exposure, this electrical charge is digitised and assigned a brightness value relative to the amount of charge.

By converting the charge from a whole load of photo-sensitive elements placed closely together, it's possible to capture and recreate the subject placed in front of the imaging device. In practice, it's just like placing transparent graph paper over the subject and measuring the brightness in every square.

Resolution

The quality of a CCD is known as its resolution, and measured in millions of pixels or megapixels.

Digital zoom

Most digital cameras offer a digital zoom facility. Unlike a genuine optical zoom that uses lenses to increase the size of small subjects, a digital zoom simply crops the image and presents this as the end result. Certainly, the subject will appear to fill more of the frame, but at the cost of resolution. Better instead to disable the digital zoom and know truly what you're getting – you can always crop the image later in software.

The megapixel figure is calculated simply by multiplying the number of horizontal and vertical pixels on the CCD.

The first digital cameras had mere 320 x 240 or 640 x 480 pixel resolution. Even SVGA and XGA resolutions of 800 x 600 or 1,024 x 768 couldn't quite break megapixel resolution. We had to wait for SXGA chips offering 1,280 x 1,024 pixels for true 1.3megapixel resolution.

Digital camera resolutions have steadily increased over the years, with the most popular models today offering 1,600 x 1,200 (described as 2.1 megapixels) or 2,048 x 1,536 (known as 3.3megapixels).

Each of these chips produces an aspect ratio of 4:3, which matches your TV set or most PC screens. This is a squarer shape than that of 35mm or APS film.

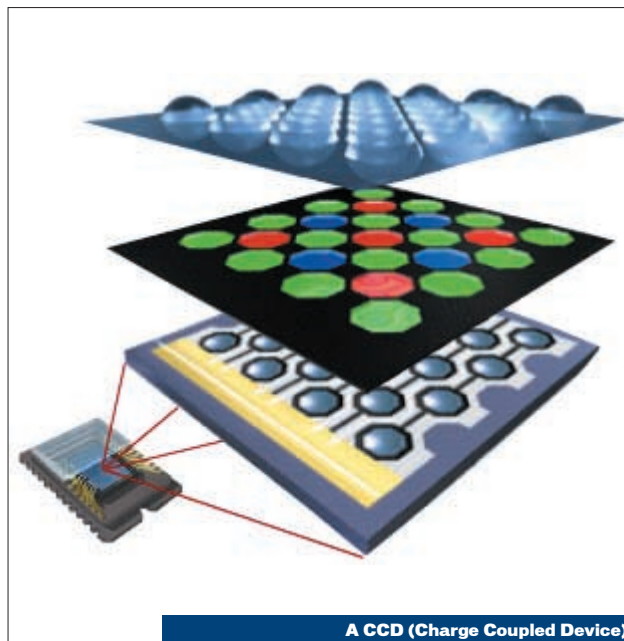
Consequently, some 3.3megapixel cameras offer a wider 3:2 aspect ratio mode to match 35mm film, although they do so by simply cropping the vertical size of the frame. Interestingly, Kodak uses different CCDs to those in most other digital cameras, and delivers a true 3:2 aspect ratio image – for example, its 3.1 megapixel DC-4800 model produces genuine 2,160 x 1,440 pixel images.

Anyone with a calculator, however, will notice that 1,600 x 1,200 actually equals 1.9 megapixels, while 2,048 x 1,536 equals 3.1 megapixels. The reason they are described as having 2.1 and 3.3 megapixel chips respectively is that all CCDs normally lose effective pixels around the edges for control and white balancing applications.

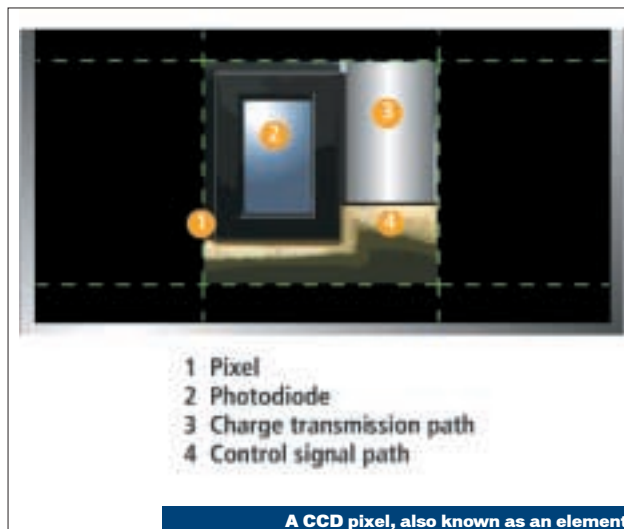
What's in a CCD?

You may believe that lenses and filters only enter the equation at the creative end of photography, but colour CCDs feature both built onto the chip itself. Since the photo-sensitive elements of a CCD can only measure brightness and not actual colour, each is covered by a filter.

By using combinations of red, green and blue filters across the entire surface of the chip, a CCD



A CCD (Charge Coupled Device)



A CCD pixel, also known as an element

can effectively take colour pictures in one single exposure.

A tiny micro-lens is also employed for each element to focus the incoming light through the filter and onto the sensitive surface itself. Normally four elements are used to create one colour pixel: one red, one blue and two green to reflect relative spectrum efficiency and to allow a simple geometric pattern.

Clearly the light-sensitive area of each element on the CCD dictates overall camera sensitivity, so the larger the area, the better.

However, each element must be able to communicate how much charge it is storing, and therefore requires contacts that occupy a significant 'dead' area

on the chip's actual surface. In addition, as resolutions increase on chips that remain similarly sized, the actual photo-sensitive area decreases.

Super CCD

Fujifilm believes that at the 3.3 megapixel mark, the photo-sensitive area of a conventional CCD begins to be compromised, reducing signal-to-noise ratio. The company's solution is the proprietary Super CCD technology, inspired by the human eye and our perception of our surroundings.

Fujifilm reckons that by turning its photo-sensitive elements by 45 degrees, making them octagonal in shape and arranging them in a honey-

combed pattern, the horizontal and vertical distances are reduced, thereby increasing apparent resolution in these crucial directions. It has also eliminated the need for both signal and charge transmission paths from each element, instead just using the latter to maximise the overall light-sensitive area of its chip.

This combination of factors allows Fujifilm to claim that the resolution of Super CCDs is effectively up to 60 per cent higher than a conventional CCD. Consequently, despite only having a genuine 2.4 megapixel Super CCD in its FinePix 4700 Zoom camera, Fujifilm describes it as having 4.3 megapixel resolution. Similarly, the genuine 3.2 megapixel Super CCD of the FinePix S1 Pro SLR, is described as having 6.1 megapixel resolution.

Both cameras indeed deliver 4.3 and 6.1 megapixel image files, but do so with cunning processing which Fujifilm is keen to point out is more sophisticated than conventional software interpolation. (See Results pages later in this *pcwexpert* for comparisons).

Flash

All photographic devices require light to make a picture, and when there's not enough around, you simply have to provide your own with a flash. All digital cameras feature built-in flashes that are effective over a few metres, but they can vary in sophistication.

Most common is the red-eye reduction mode that usually fires off a pre-flash to reduce your subject's pupils and therefore also the amount of light reflected back which creates the demonic red-eye effect. It's difficult to eliminate red-eye though, particularly when the flash is so close to the lens.

Professionals normally use a separate flash gun on the end of a bracket, and this approach can be taken on higher-end digital cameras that feature an external flash sync port.

Finally, look out for rear-curtain modes that fire the flash at the end of a long exposure,

thereby freezing the action with a satisfying blurred trail behind it, rather than in front which is what would normally happen if the flash fired first.

Processing

Once the exposure is complete, the digital camera starts to perform some additional processing. Most models automatically sharpen the image, although this is normally user-adjustable. Additional effects like black and white, negative, solarised or sepia tone can also be applied at this point.

Some cameras can also interpolate the image, increasing image resolution, albeit without actually creating any additional detail. As discussed in the 'Making prints' box (right), interpolation can prove useful to smooth jagged edges on big enlargements.

Note that in-camera interpolation is working with raw uncompressed information, which is preferable to later enhancing a compressed image on your PC. On the downside, since the image sizes are increased, so are the file sizes with the result of not getting as many pictures in the limited memory. Since in-camera interpolation usually only increases the image size fractionally, we recommend you ignore it and post-process using PC software instead.

Compression

Anyone familiar with a scanner will know that full-colour images can become very large in terms of file sizes – indeed, a raw 2.1 megapixel image measures 6MB, while a raw 3.3 megapixel image weighs in at 9MB. While higher-end cameras offer raw, uncompressed tiff modes for the best quality, you're clearly not going to get many pictures on a modest memory card. You'll also find that recording a 9MB tiff could take your camera between 30 seconds and 60 seconds.

Compression is the order of the day, with digital cameras employing the common jpeg

Making prints

The higher the resolution of the camera, the bigger the print you'll be able to make before seeing the pixels. Generally speaking, most colour inkjet printers like to be fed between 200 and 300 pixels per printed inch. Since a 2.1 megapixel camera features 1,600 x 1,200 pixels, that's sufficient to make a print around 8 x 6in, while the 2,048 x 1,536 resolution of 3.3 megapixel cameras could stretch to a 10 x 8in print.

Most photo retouching programs let you increase the apparent resolution of an image using a process known as 'interpolation'. This takes adjacent pixels, averages them and inserts this new value in between.

There's no additional detail created, but at least the jagged edges are smoothed away on big enlargements.



format. Normally this is offered at several levels of quality set by the user, which along with lowering the image resolution offer a variety of ways to squeeze more pictures into limited memory.

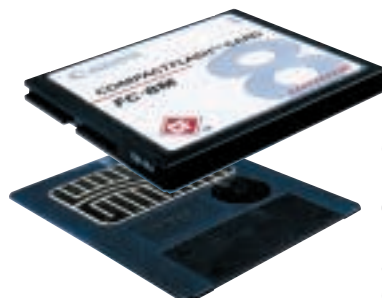
So saying, most users stick with the highest resolution of the CCD and leave their camera set at the best-quality jpeg setting. Despite starting with the same 9MB raw image size, however, a bunch of 3.3 megapixel cameras may not produce the same sized 'best quality' jpeg file. In our tests we've seen files as small as 800KB and as large as 2.5MB from different 3.3 megapixel cameras. As you might expect, the higher compressed files suffered from slightly lower image quality, but benefited from storing more pictures.

Storage

With even compressed image files typically measuring at least 1MB each, you're going to want plenty of storage space. All but the very cheapest digital cameras store their pictures on removable

memory cards; these are currently available up to 128MB each, but most cameras are supplied with 8MB or 16MB cards. While you can re-use memory cards, you'll need something to copy your pictures onto first. A PC's ample hard disk is ideal, but you'll need to have your PC near to hand. This is why digital photographers who go away for more than a few days normally take a notebook with them, simply to free up capacity on their expensive memory cards.

There are three common card formats in use, all using similar Flash memory technology which can remember data without the



CF (top) and SmartMedia

need for electricity to keep it awake. Prices are similar too, with 64MB costing around £125. Currently, the most flexible is the Compact Flash (CF) format which, in its sturdy 42 x 36mm case, can contain memory, a modem, Ethernet connectivity, or even a tiny hard disk. The latter, made famous by the IBM Microdrive, requires the slightly thicker CFII format and obviously a wider slot to accommodate it. With 340MB capacity (around £350) and more to come, the Microdrive is ideal for digital photography, but sadly many cameras that use Compact Flash memory cards cannot accommodate it.

The other two popular Flash memory card formats are the very slim SmartMedia and chewing-gum-shaped Memory Stick. The latter is a proprietary format invented by Sony, but licensed by many companies for future products. Finally, there's

Sony's range of Mavica cameras that store their images on standard 1.4MB floppy disks. Sony also produces a floppy disk adaptor for reading Memory Sticks, which has the dual purpose of easily accessing Sticks in PCs, as well as expanding the storage potential of Mavica cameras. Sony has also extended the Mavica concept with its MVC-CD1000, which incorporates a built-in mini-CD writer for 156MB of storage per 3in disc.

Transfer

At some point you will want to get the images off your memory card for viewing. Early digital cameras connected to your PC's conventional nine-pin serial port, but as file sizes increased, so did transfer times.

Fortunately, a USB interface is now standard on nearly all new digital cameras, reducing jpeg image transfer times to just a couple of seconds each.

Virtually every digital camera also features a composite video output, which can fill your TV screen with your pictures – great for an instant slideshow.

The future is bigger, better and online

Higher resolutions, larger file sizes, better compression and online imaging services are on the horizon

From Box Brownie to multi-megapixel digital, cameras have come a long way in 100 years, but what does the future hold?

In megapixel terms, resolutions are steadily increasing, despite various pundits and even some manufacturers believing we're already at sufficient quality for most photographers. The fact, however, remains that the technology market loves bigger numbers whether or not they're essential for day-to-day applications, and digital cameras are no exception.

Towards the end of the summer, Olympus announced its E10 SLR digital camera with a genuine 4megapixel CCD, boasting 2,240 x 1,680pixel images. Compared to the 2,048 x 1,536pixel images of current 3.3megapixel models, you're only looking at making prints up to an inch or two bigger in each direction, but for quality junkies, it's the way forward. Interestingly, while being extremely cagey, other digital camera manufacturers have implied that the CCD in next year's higher-end models could skip four and head straight for the 5megapixel mark.

So where will it all end? Whatever anyone tells you, there are plenty of applications for higher than even 5megapixel resolution. Take typical 35mm film scanners with 2,700dpi resolution, producing scans up to 3,888 x 2,592pixels, measuring 28.8MB. If these were digital cameras, they'd be described as having 10megapixel resolution, and it's this level that serious photographers desire.

Edging ever-closer to this dream is Pentax with its first digital SLR, previewed at this year's Photokina show. With images of 3,040 x 2,008pixels, it'll be the first 6megapixel digital camera, although it's expected to carry a price tag to match.

Beating everybody in the resolution stakes, however, is Kodak which, several weeks before

Photokina, announced a 16megapixel CCD with 4,096 x 4,096 (48MB) resolution. At the show, this had turned into a real product: the DCS Pro Back (pictured below) for professional Hasselblad and Mamiya medium



Kodak (top) and Foveon cameras offer higher resolutions

format cameras (www.kodak.com/go/dcsproback). It can be used while 'tethered' to a PC across a FireWire interface, or wireless with its two PC Card slots.

Coincidentally around the same time, a Silicon Valley imaging company, Foveon, (www.foveon.net) announced a 16megapixel chip. However, unlike Kodak's CCD, Foveon's uses CMOS technology. While CCDs require dedicated fabrication facilities, CMOS sensors can be produced in the same factories that make almost every other type of processor. This makes CMOS a much cheaper technology, but sadly one that's so far not matched CCDs in terms of quality.

Partnered with National Semiconductor on the

fabrication front, however, Foveon reckons it's solved CMOS quality problems and believes its 16megapixel imaging chip will also come in much cheaper than Kodak's. Foveon expects a number of professional cameras based around its chip to become available over the next year.

Of course, higher resolutions are all very well, but with them come larger file sizes along with processing and storage issues. Sadly, Flash memory cards remain expensive media with relatively modest capacities. Towards the end of 2000, only the Compact Flash standard

Wallet (www.mindsgear.com), costing \$499 (around £300) with a PC Card slot and 6GB of storage.

The future isn't just about higher-quality still images. Digital cameras are converging with other media, offering short bursts of quite respectable video and audio capture. Several digital camcorders are also offering megapixel still picture capture, and the internal ability to transfer pictures from tape to Flash memory cards. Within a few generations we may see fully converged cameras offering high-quality still and motion capture.

While increasing resolutions and convergent gadgets will keep photographic enthusiasts happy, the biggest driving force for digital mass-market acceptance will be a new breed of online imaging services. Kodak and Sony already offer services where images can be uploaded to a free website, from which friends and family can view or email them or, better still, order physical prints, CD-ROMs, mugs, plates, T-shirts and almost anything else.

Sony's ImageStation (www.imagestation.com) relies on you to upload your images so requires a fast permanent Internet connection like ADSL or a cable modem. ImageStation is currently available in the US and Japan, with a European launch expected imminently. Kodak's PhotoNet (www.photonet.com) lets you upload your own images, or Kodak will do it for you.

As labs become increasingly digital-friendly, we can expect to find consoles where we can insert our memory cards and either order prints or upload images to a website – such services could also free up your precious memory cards mid-holiday.

Public acceptance of such services will be the turning point for digital imaging in the mass market as this is what photography is all about: easily sharing pictures and memories with your loved ones. Everyone, say cheese!

Digital camera terminology

The **pcw expert Glossary** gives you the lowdown on the acronyms and words surrounding the subject of digital cameras

Aperture The diameter of the objective lens in an optical system. The bigger the aperture, the greater its light-gathering capability. Since typical photographic lenses feature multiple elements, the aperture is the effective light-gathering capability of the system as a whole. By placing an adjustable iris at the far end, the aperture and hence exposure can be controlled. Closing the aperture also increases the **depth of field**.

Artefacts Undesirable elements on an image introduced through limitations of a digital device, processing or compression system. They typically reveal themselves on the image as snow-like speckles, blocks or banding.

CCD Charge Coupled Device. A chip used in many imaging devices. Employs a grid of light-sensitive elements that stores an electrical charge proportional to the amount of light falling on it. Charge is converted into digital information for processing.

CMOS Complementary Metal Oxide Semiconductor. Alternative imaging chip traditionally used in budget webcams. New large format CMOS developments for high-end digital cameras reduce noise and inconsistencies while increasing sensitivity.

Compression Mathematical formulas used to identify redundant information in a digital file and remove it to save storage space or transmission time. Compression can either operate in a lossless form where there is no loss of quality, or lossy, which reduces quality, but can significantly decrease file sizes.

Depth of field Distance range within which objects in a picture appear sharp and in focus. Closing the aperture of a lens will increase its **depth of field**. Wide-angle lenses have broader inherent depth of field ranges than long focal length lenses.

DPOF Digital Print Order Format. Standard for describing where images are stored on a

memory card and means by which a user can mark specific pictures for later printing.

EV Exposure Value. Refers to a range of lighting conditions from dark to bright that can be recorded or measured by an imaging system. Also used to describe increments during exposure compensation – an increase of 1EV is equivalent to doubling the exposure.

Flash memory Rewritable memory that doesn't need power to remember data. Used in various removable card-based formats by digital cameras. Most

number. The focal ratio of a lens is usually described with the aperture at its most open setting.

Gain The sensitivity of an electronic sensor, such as a CCD or CMOS chip. Increasing the gain makes the chip more sensitive to light, but also increases the amount of random electronic noise on the image.

Gif Graphics Interchange Format. Reduces colour depth to 8bit, then employs lossless compression. Some cameras offer a gif option for crisply recording text and diagrams from black and white boards.



common memory card formats are Compact Flash, Smart Media and Memory Stick, all incompatible with each other, but offering similar performance at similar prices.

Focal length Literally the distance between a lens and the sensor placed at its focal point, measured in mm. Today's photographic lenses, however, feature groups of glass or plastic elements to deliver fixed or zoom focal lengths in convenient packages. Focal length now most commonly refers to the field of coverage of a lens, with longer focal lengths having smaller fields of view than shorter, wider ones.

Focal ratio The ratio between focal length and the aperture of the lens, also known as the 'f'

Interpolation Mathematical process of increasing apparent image resolution by averaging adjacent pixels and inserting new ones. Useful to smooth edges on big enlargements.

Jpeg Joint Photographic Experts Group. Most common image file format used by digital cameras and on the web. Employs lossy compression, but at a user-variable level.

Lossy Type of digital compression that permanently throws away information in an attempt to reduce file sizes.

Macro Close-up mode that sets the camera lens to focus as close as possible. This distance varies between different cameras and lenses. The closer the focus, the larger the reproduction.

Megapixel Quality of a digital camera in terms of resolution. Multiplies the horizontal and vertical number of pixels on the imaging chip to give one figure. Note: megapixel figures include pixels around the edge that are used for control operations, resulting in a slightly lower effective resolution.

MPEG Motion Pictures Expert Group. Proposes standards for compressing and delivering digital video. Highly compressed MPEG-1 format used on VideoCDs and Sony digital still cameras. High-quality MPEG-2 format used for DVD video.

QuickTime Popular standard for compressing and delivering digital video on computers. Developed by Apple, but players are also available for Windows. The QuickTime mov format is used by many digital still cameras for storing short movie clips.

Shutter Opens briefly to expose light to camera's sensor. Most cameras can adjust the shutter speed to control the exposure – typical shutter speeds range from several seconds to as quick as one-thousandth of a second. Fast shutter speeds let in the least light, but also freeze action, while slow ones let in more light, but blur movement. Longer shutter speeds may require a tripod or solid base to prevent user camera shake.

Super CCD Fujifilm's proprietary imaging chip, which uses octagonal shaped pixels, arranged in a honeycombed pattern. Fujifilm claims this increases sensitivity along with apparent horizontal and vertical resolution. Note that Fujifilm describes a 2.4megapixel Super CCD as being equivalent to a 4.3megapixel conventional CCD.

Tiff Tagged Image File Format – a popular graphics file format. Offered uncompressed by many digital cameras to eliminate compression artefacts of jpeg. Tiffs from 2.1 and 3.3megapixel digital cameras measure 6MB and 9MB each respectively.

Macros, noise and resolution in close-up

All cameras have their limitations, so testing our digital ones under some punishing conditions produced interesting results



Macro



Macro

Macro modes set the camera lens to focus as close as possible, thereby allowing you to take photographs of small subjects. Not all macro modes are created equal however.

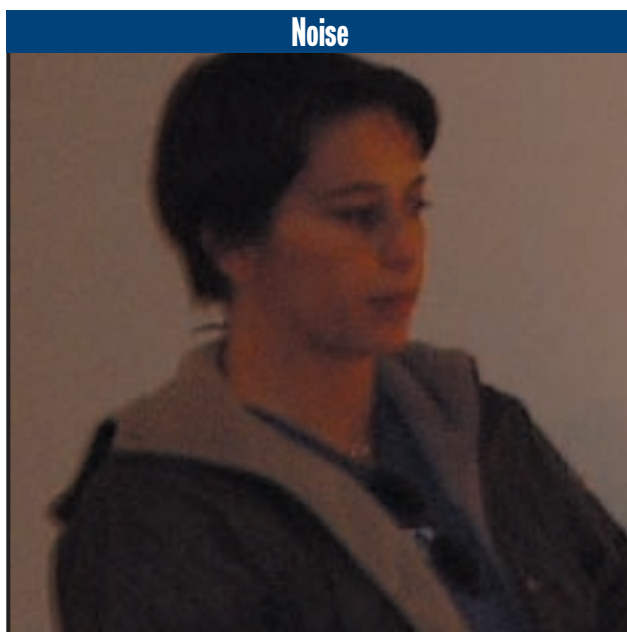
Above we photographed a £2 coin as closely

as possible, first with the Nikon CoolPix 990 (left), then with Epson's PhotoPC 3000Z (right). Nikon's camera can get as close as 2cm,

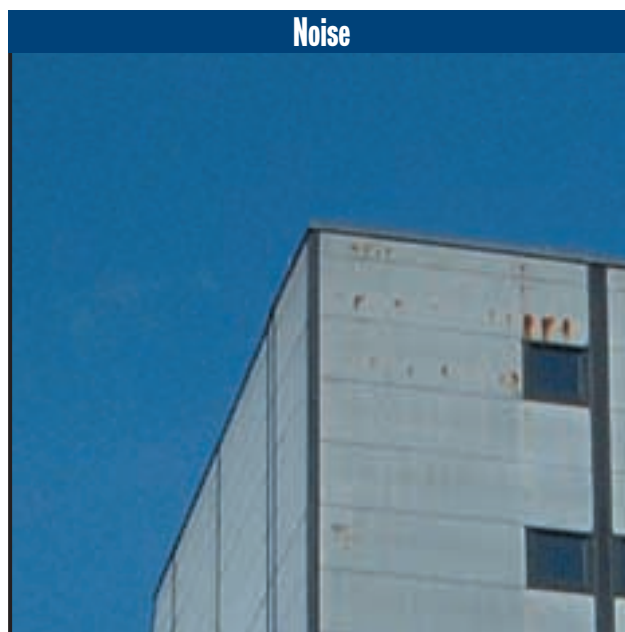
compared to the Epson's 20cm.

Clearly by being able to focus much closer,

the Nikon 990 is able to produce a larger reproduction, making it the ideal camera for macro enthusiasts. Sadly, the 20cm closest macro distance on the Epson model is common on many cameras.



Noise



Noise

Above are two images taken with the Fujifilm FinePix 40i camera, which uses Fujifilm's own Super CCD technology.

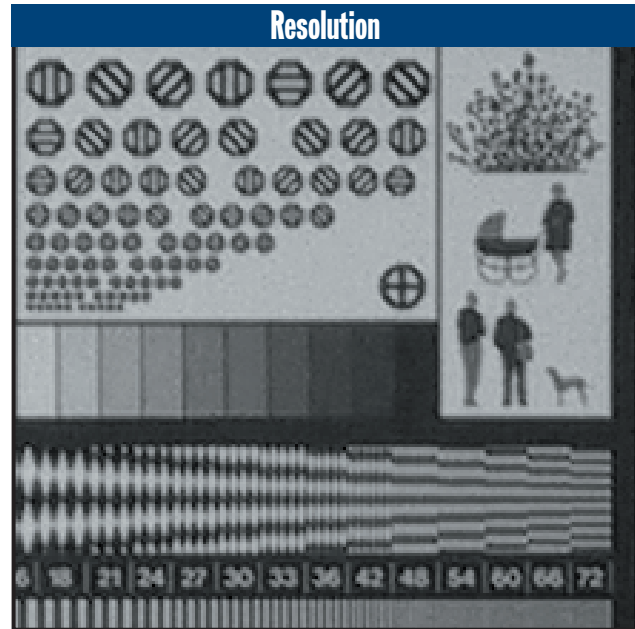
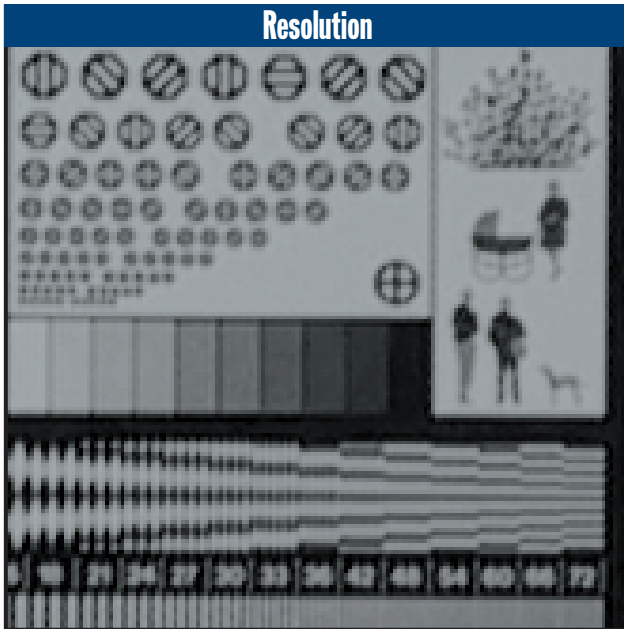
Each has been enlarged to 47 x 35cm (fractionally larger than a PCW double-page spread), and a small portion cropped for

reproduction. The picture above left was taken indoors under very low light – an environment where all digital cameras will suffer from electronic noise as the chip's gain is increased in sensitivity.

However, note the speckled effect of electronic noise on the picture, which also

appears in the blue sky of a very well illuminated composition, above right.

In our tests with Super CCD so far, this speckled electronic noise is present on almost all pictures, even under ideal photographic conditions.



The difference between a 2.1 and a 3.3megapixel camera is its ability to resolve finer detail.

We arranged a pattern of optical test targets on a wall, and photographed them from the same distance using both a Canon PowerShot

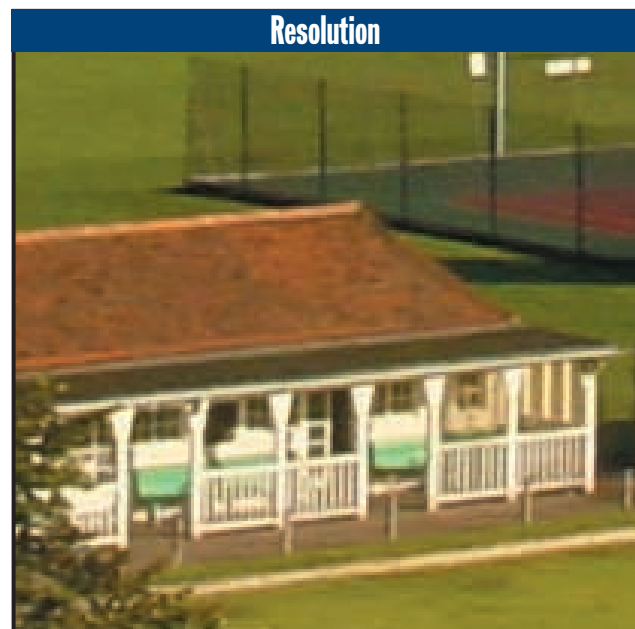
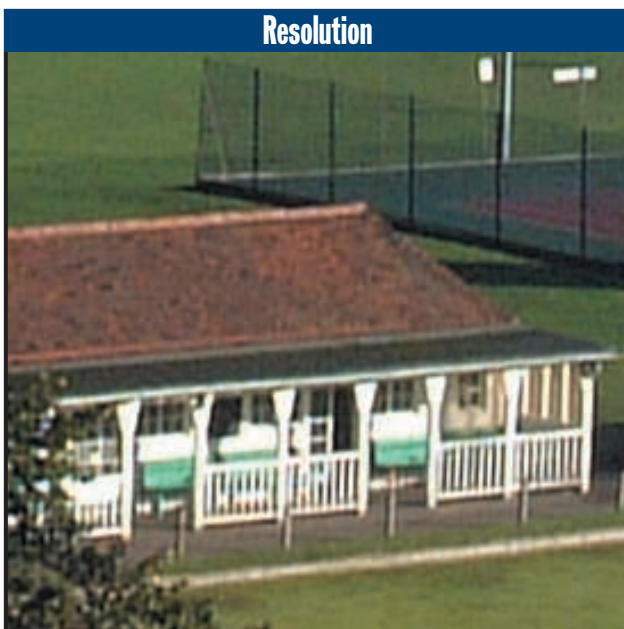
S10 and a PowerShot S20. These are essentially the same cameras, except they are fitted with 2.1 and 3.3megapixel CCDs respectively.

To show the differences on this page, we enlarged each image to 94 x 70cm and

cropped the same small portion shown above.

Note how the S20, on the right, resolves finer details in every respect than the S10 (left).

Such differences are easily visible on an A4 inkjet print.



Fujifilm believes its Super CCD technology resolves 1.6 to two times that of a normal CCD imaging chip, and hence describes its 2.4megapixel Super CCD as a 4.3megapixel chip. This is the chip used in the Fujifilm FinePix

4700Zoom, 4900Zoom and 40i cameras. We took the same picture with the 40i and a genuine 3.3megapixel Sony Cyber-shot DSC-S70, enlarged each to 80 x 60cm and cropped a small portion above left and right respectively. Apart

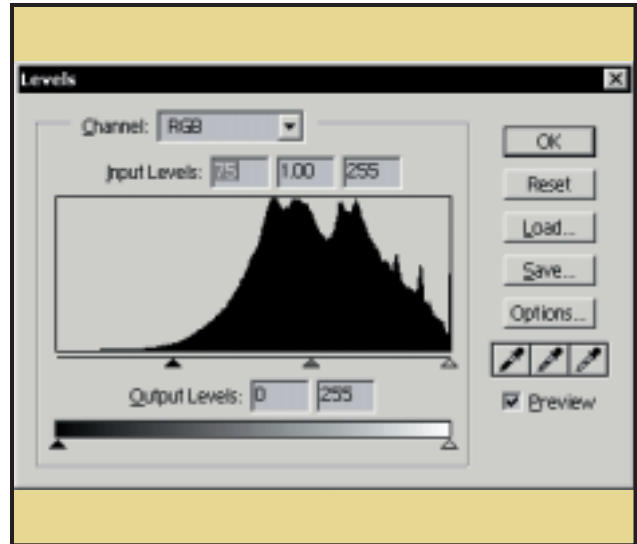
from the obvious difference in colour balance and saturation, notice how both resolve similar amounts of detail in real-life situations, but that the Fujifilm, left, suffers from electronic noise on areas such as the grass.

Image optimisation

The beauty of digital cameras is the opportunities they offer for retouching over- or under-exposed pictures. Give it a go...



1 Ever had that sinking feeling when you get photos back? Perhaps they're not as good as you'd hoped. While digital cameras allow you to review your pictures on their LCD screens to see if anything's gone horrendously wrong, the finer aspects of exposure and sharpening may not be so apparent. We took a series of photos on a recent helicopter ride, but were disappointed that they were all heavily over-exposed. We noticed this on the screen during playback, but by that time the journey was over. Fortunately, a little cunning image manipulation can save the day.



2 First look at the levels of the image. In Photoshop, go to the Image menu and choose Levels from the Adjust sub-menu – other applications are similar. You'll be presented with a histogram – a graph plotting the tonal range of the image from black to pure white with 255 levels of grey in between. Ideally, the graph should touch both ends in order to display dark shadows and bright highlights. Ours is severely missing in the shadow department, but dragging the left input level from 0 to, say, 75, stretches the shades we've captured along to the dark side.



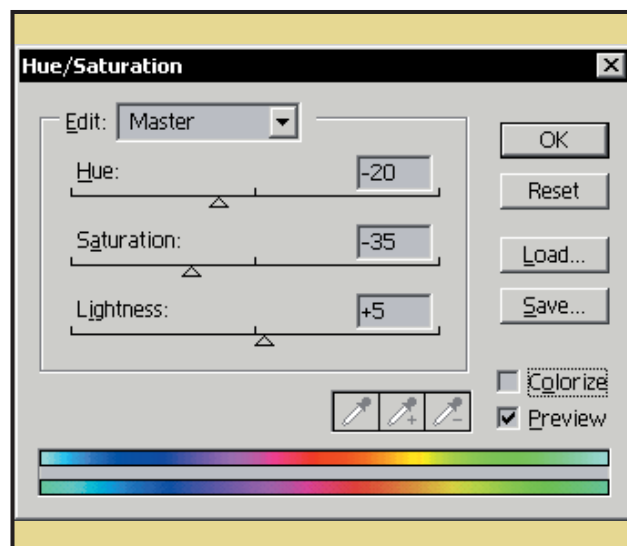
5 Our picture still has a certain unreal '*je ne sais quois*', but in two fell swoops we've seriously improved it. The trick with all photo retouching is to experiment and try out different adjustments until you get the desired effect – and remember 'desired' and 'effect' are the operative words. Next time someone says your picture is too sharp, dull, bright or out of focus, tell them this was the way you'd intended it to be. Obviously it helps if it was deliberate, but remember the goal of creative photography is to get the pictures you like, and have fun in the process.



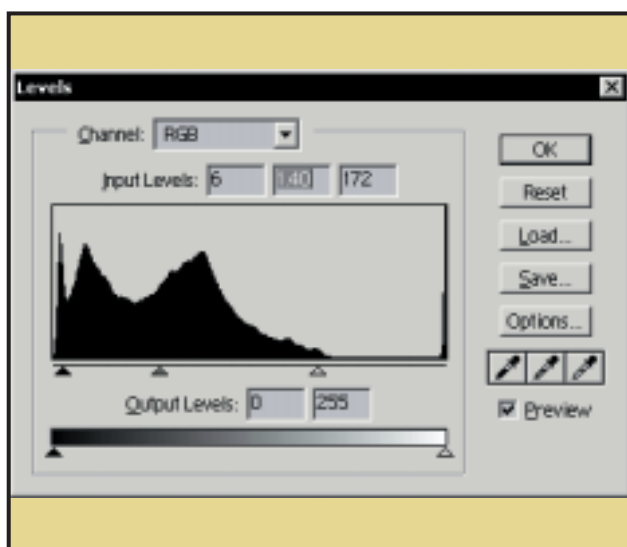
6 Following on from the previous example, here's another way you can apply the tricks mentioned to improve a photo. This time we've got a portrait that really could have done with a flash. Fortunately, we can adjust the levels to brighten it up a bit and salvage an otherwise perfectly good picture. Even after brightening and adjusting the mid-point, we'll still ensure there are some deep blacks as these can turn a dull print into one that is much punchier. Again, don't feel bad about adjusting reality – feel free to play until you get a good-looking picture.



3 Stretching our limited range of levels across the full spectrum of light and dark improved the image, but more work could be done. In Levels we moved the mid-point slightly to the right to further darken the middle shades of grey. The result is displayed above. While this is an extreme case, most digital photographs and, indeed, scanned photos can be improved by moving the left input level inwards even just a fraction to ensure that prints have black blacks. In our example, the image has been adjusted so heavily that the colours now appear unnatural.



4 Many digital cameras tend to produce fairly saturated images at first, and adjusting the levels so heavily on ours has only accentuated the problem. If your colours look unreal, try de-saturating the image. This option is offered by most photo retouching applications. In Photoshop, go to the Image menu, and choose to adjust the Hue/Saturation. You could adjust each primary and secondary colour, but for ease we've opted to go for Master and do it all in one. After de-saturating the image, we slightly adjusted the Hue and Lightness.



7 The histogram for the dull picture reveals the lack of information from about three quarters of the way up the brightness scale. Consequently, we've slid the right-hand input level towards the left to the point where the very brightest shades have been captured – this is around the 172 mark, which shows just how many shades haven't been captured up to the brightest level of 255. While stretching out the shades to the brightest 255 point helps, we also lightened up the mid-point and fractionally darkened the shadow end to ensure we had some truly black blacks.



8 After adjusting the levels, we also slightly de-saturated the image and applied an unsharp mask for good measure. Most digital cameras already apply a little sharpening automatically, while others offer different levels of sharpening in a menu. Again, there's no hard and fast rule, although many slightly dull pictures can be perked up with a little sharpening. This particularly applies to scanned images that almost always look a little soft. Our result again is not perfect, but after only a little work is a considerable improvement on the original.

Camera masterclass

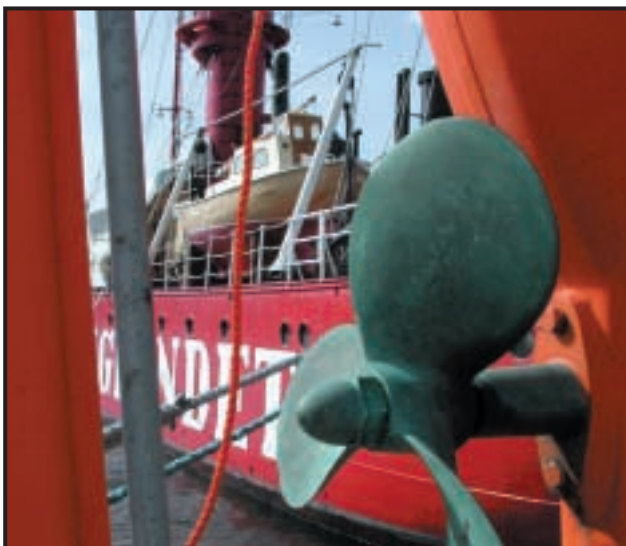
If you want to be creative and take 'arty' shots we've put together some tips to help you make an impression



1 Sparklers are a great photo opportunity, but a normal flash shot captures the person but wipes out any sparkling, while a long exposure grabs the sparks but leaves the person dull and blurred. The solution is a combination of the two. Set shutter speed to around two seconds and force the flash to fire – some cameras call this slow synchro mode. Better still, use a 'rear-curtain' option which fires the flash at the end of the exposure, freezing the action with a trail behind. This photo was taken with a Sony Cyber-shot S70 in shutter priority mode with forced flash.



2 Often the most satisfying photos are those involving abstract shapes and bright colours. Digital cameras with their saturated colours are well suited to this kind of photography. Here we've captured flags flapping in the breeze. With the chaotic nature of wind and flags, your best bet is to frame your shot and take several pictures in quick succession, increasing your odds of getting a good one. The beauty of digital is that you can delete those that don't work. Photo taken using the fully automatic mode of a Canon Digital Ixus with flash forced off.



5 In theory, this shot is very similar to the orange Beetle, where we wanted the maximum depth of field so that both foreground and background were in focus. In aperture priority mode we set the focal ratio to the highest number, such as f8 or f11. In the case of the Beetle, we focused on a mid-point halfway along the car to give the lens the best chance of getting everything in focus. With no mid-distance point in this picture, we focused on the propeller and prayed the boat would also be sharp. Taken with Epson PhotoPC 3000Z, aperture priority mode f8.



6 Don't let an overcast day make photos dull. Use a fill-in flash to illuminate the foreground – the flash is only effective over a couple of metres so it will not affect the background. Most cameras offer a fill-in flash option by forcing it to fire – normally you'd cycle through the flash options until the lightning symbol is always on. Here we've also gone for a large depth of field to ensure the background is in focus, and chosen a higher viewpoint to capture both the people and the background. Photo taken with Sony Cyber-shot S70 at f8 in aperture priority mode and the flash forced to fire.



3 There's something about an orange Beetle on a sunny day, but rather than taking a photo from the side, we crouched down and set the lens to its widest focal length. Wide-angle shots where the foreground is close can be effective, but your decision is whether to throw the background out of focus or not. We opted for a large depth of field where both near and far are in sharp focus. Using aperture priority mode, set the focal ratio to its highest, f8 or f11, which results in the maximum depth of field. Photo taken with Sony Cyber-shot S70 at f8.



4 Nighttime photographs can make great shots. Traditionally, you'd find somewhere stable to leave your camera and make an exposure of several seconds using shutter priority mode. Where there's no foreground object that needs illuminating, switch the flash off. If your camera doesn't adjust shutter speeds, you may still be able to trick it into a long exposure. We used a Canon PowerShot S20 in fully automatic mode, but switched the flash off, forcing it to make the longest exposure it can. On the S20 this is only two seconds, but still produces the trailing lights.



7 Macro photography lets you take close-up photos of small objects. You don't always need a tripod and patience either, as proved by this handheld shot. We set the focusing mode to macro, which is normally the small icon of a flower. We liked the natural sunlight, so switched the flash off. Finally we wanted to throw the background out of focus, so selected the widest aperture – f2 or f2.8. Note that this small depth of field also looks great for portraits. Taken with Nikon CoolPIX 880 using macro and aperture priority modes and flash forced off.



8 Many digital cameras have a lens thread to attach a filter. Since the lens physically moves in and out, a small extension tube has to be screwed in first. We wanted to increase the deepness of a blue sky, so we fitted a circular polarising filter and rotated it until we got the maximum effect. Polarisers produce the deepest blue skies when pointed opposite the sun. While this has produced a deeper blue, compare it to a genuine blue sky, such as the unfiltered one behind the flags earlier. Taken with Sony Cyber-shot F505V in automatic mode with Hoya circular polarising filter.



hands on

Thanks to Windows Me, DOS has finally died a death. But if you've grown up with the command-line operating system (as most of us have) then it's a bit of a shock, especially when everything goes a bit pear-shaped in Windows. Luckily Tim Nott is on hand with this month's Windows column (p268) to help you through the trauma.

If you're new to Windows NT, or even a relatively experienced user, you may be in a bit of a quandary about service packs. Which ones do you need to install and which you should avoid, and for what reasons? As ever, Roger Gann is on the case and has a complete rundown of the dos and don'ts when it comes to those pesky service packs (p274).

There's plenty more for you to burrow your way through in this month's Hands On section. Chris Bidmead gets to grips with wireless technology (p276). Ian Waugh looks at using his desktop PC as a net radio thanks to Windows Media Player (p288) and Ken McMahon shows you how to sharpen up your jpeg images (p290).

NIALL MAGENNIS, FEATURES EDITOR

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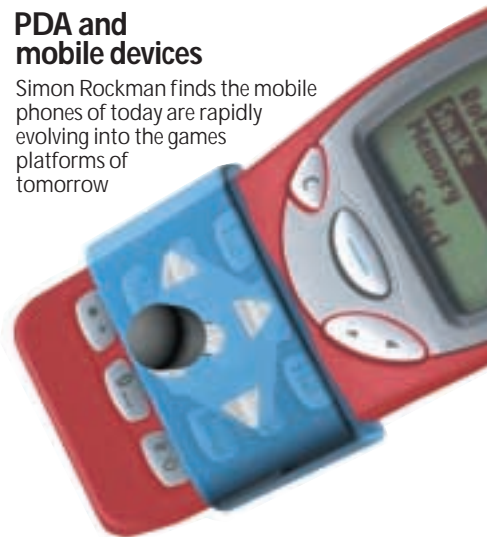
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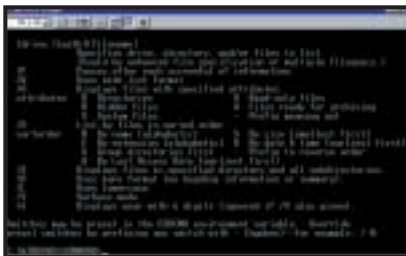
Got a problem? Our Hands On experts answer your questions and solve your problems

Windows

Q How can I print the screen when working in the DOS environment?

Deepak Shukla

A If you're in MS-DOS mode then, strangely enough, pressing the Print Scrn button on the keyboard does exactly that. If you're running DOS under Windows, a windowed DOS session will be captured to the clipboard as an image if you press Alt and Print Scrn – just as in any other application. You can then paste this into an image-editing program, such as Windows Paint, and print from there. In full-screen mode under Windows, the Print Scrn key captures the text contents of the screen to the clipboard; so you can paste it into Notepad and then print.



Press Alt and Print Scrn to capture the image, or go full screen to grab the text

Q Since upgrading my version of Internet Explorer, I no longer get the message asking if I want to disconnect when I close the last IE window. There's a setting, Disconnect if idle (under Control Panel, Modems), but this is greyed out, as is a similar setting under DUN properties. How can I reinstate both this and the Disconnect prompt?

Gary Maclure

A This setting seems to move around a lot. On a machine using IE5, I've tracked it down to Control Panel, Internet Settings (there are other routes) on the Connection tab. Here you'll see your list of Dial-Up connections. Select the default connection and click the Settings button. The next dialog shows the user name and a row of asterisks representing the password. Beside these are two buttons:



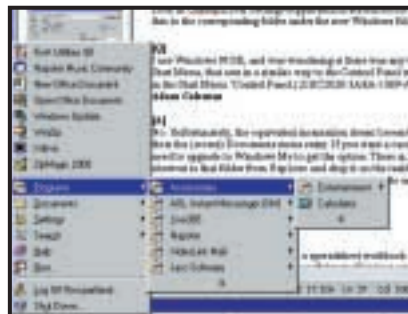
The DUN disconnection options are kept well hidden

Properties leads back to the same dead-end as the direct assault on DUN properties, but the Advanced button leads to the options you desire.

Q A strange question, but one I thought I'd ask nonetheless – is there any way to change the Start menu button to an icon of my choosing? It seems weird to have to press the Start button to shut my computer down and I thought it'd be a good idea to change it to something else.

Steve Jones

A You can change the text on the Start button or the icon itself, but be warned – it is a bit fiddly. To change the text, open your Windows directory and copy the file explorer.exe to a temporary working directory. Use a hex editor (you can download UltraEdit-32 from www.idmcomp.com) to search for the last occurrence of the string; 53 00 74 00 61 00 72 00 74. These are the letters in the word Start, separated by null characters (#00). You can replace any of the five characters but don't change the null ones – you can use shorter words by including spaces (#32) for the remaining places. Save the changes and exit to



DOS. Backup the original file and replace it with your modified version. Some versions of Windows require you to

alter every occurrence of the string for the changes to take effect.

To alter the icon, copy the user.exe file which you can find in your Windows\System directory to a temporary directory. Using an icon editor that can read executables, open the copy of user.exe. The Start menu uses several versions of the flag logo; each is a different size and which is displayed depends on which size of font you have configured the Start menu to use (see Control Panel, Display Properties, Appearance). The actual icon is probably the 16 x 16 or 22 x 22 variation.

Save your changes, exit to DOS, backup your original file and replace it with your new one. Next time you restart Windows, the change should take effect.

Q I recently reinstalled Windows but renamed the previous Windows folder first (rather than deleting it), just in case there was something there that I would need. Sure enough, all my Outlook 2000 data has vanished. I've looked in Oldwin\Application Data but there doesn't appear to be anything relevant there. Where can I find all of my old contacts, emails and calendar entries? This is on a single-user, Windows 98 SE machine.

Scott Jenner

A Look in Oldwin\Local Settings\Application\Data\Microsoft\Outlook for the file Outlook.pst, and copy this to the corresponding folder under the new Windows folder.

Q I use Windows 98 SE, and was wondering if there was any way to put a My Documents shortcut in the Start menu, that acts in a similar way to the Control Panel menu which you get when you name a folder in the Start menu 'Control Panel.{21EC2020-3AEA-1069-A2DD-08002B30309D}'?

Adam Coleman

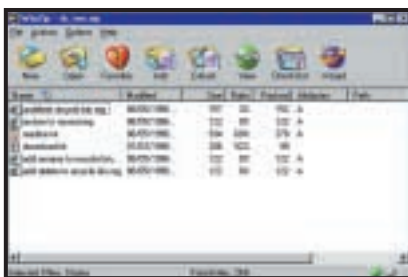
A No. Unfortunately, the equivalent incantation doesn't seem to work, although you can open the folder from the (recent) Documents menu entry. If you want a cascading menu of My

Documents, then you need to upgrade to Windows Me to get the option. There is, however, another trick you can use. Drag a shortcut to that folder from Explorer and drop it on the taskbar, to create a new toolbar. Drag the handle towards the system tray until just its name and the double arrow are visible. Click on the latter for a cascading menu.

Q How can I rename the Recycle Bin? I can rename other desktop icons but not Recycle Bin.

Dominic Newton

A The simplest way is to download a registry patch from ftp://ftp.creativelement.com/pub/win95ann/rb_ren.zip. You'll need WinZip installed on your computer but once the file has downloaded, double-click on the rb_ren icon. Next, double-click on add rename to Recycle Bin.reg and the change will take effect immediately. To rename your Recycle Bin, simply right-click on the Recycle Bin icon and choose Rename from the menu. You can also choose to add delete to your Recycle Bin by running add delete to recycle bin.reg.



Download a registry patch to rename your Recycle Bin

For purists who want to manually rename the Recycle Bin, run regedit and navigate to HKEY_CLASSES_ROOT\CLSID\{645FF040-5081-101B-9F08-00AA002F954E}. Double-click on (Default) and type the new name. Click on the desktop and press F5 for the change to take effect.

Windows 2000

Q I use a switch box to run two computers connected to one monitor, mouse and keyboard. When I switch away from the one computer that runs Windows 2000 and then switch back to it, the mouse pointer has frozen and I have to reboot.

Heather Thompson

A If switching between the two computers has never worked, there's a registry fix that might help. If the switch box used to work but has now stopped working, check the cabling and mouse before trying the registry fix.

Waiting a few seconds after switching to the computer may help. Remove the mouse from the switch box for several seconds and then replace it. Check the cable connections and if these seem sound then try a different set of cables or a different mouse. If possible, check the manufacturer's website for a vendor-specific problem.

If none of this helps, you may have an inexpensive serial port switch box that, unlike most PS/2 switch boxes, doesn't provide the mouse emulation required to convince Windows 2000 that the mouse is still there. When you switch away from the computer, Windows 2000 detects the absence of the mouse but, because it doesn't support temporary removal of serial mice, it assumes it has been permanently removed.

Work around this by editing the msmouse.inf file to disable removal detection. This file is located in %SystemRoot%\Inf\Msmouse.inf where '%SystemRoot%' is the root directory for Windows 2000 system files, usually /WINNT'.

Open msmouse.inf in Notepad, scroll down to the [Ser_Inst.HW.AddReg] section, and remove the semicolon from the start of the following line:

```
; HKR,, 'WaitEventMask'
,0x00010001,0xFFFFFFFF
```

(Key: ✓ code string continues)

Exit Notepad, saving the file. Open Device Manager (right-click on My Computer, Manage) and remove the serial mouse (right-click on the entry and uninstall). Then, from the Device Manager Action menu, run Scan for hardware changes to reinstall the mouse.

Incidentally, this serial port behaviour also explains why some modems refuse to work correctly if you only switch them on after starting Windows 2000. The above fix is not recommended for this situation, but you can try to bring a modem back to life by right-clicking on the modem entry in Device Manager and selecting Scan for hardware changes.

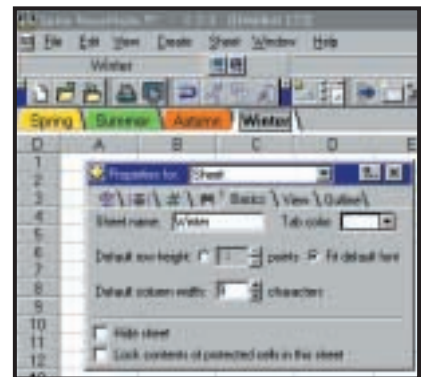
If this doesn't work, you'll have to remember to switch on the modem before starting Windows 2000.

Spreadsheets

Q Is there a way to colour the tabs in a spreadsheet workbook as they traditionally are in a normal office filing cabinet? This would prove a useful way of linking my computer databases to my office filing cabinet.

Ben Rigden

A You can do this in Lotus 1-2-3 and Corel Quattro Pro. In either spreadsheet, right-click on a tab and choose Sheet Properties and then enter a Sheet Name, which will display on the tab. Then pick a tab colour from the drop-down palette. This is a feature long-requested, unsuccessfully, by Excel users.



Different coloured tabs are possible in Lotus

Q In Lotus 1-2-3 I could drag and drop columns. How can I move a column quickly in Excel 97?

Paul Sadler

A Use the Shortcut menu. To move column A between columns D and E, right-click the column letter A and choose Cut. Then right-click column letter E (because it is to the right of the chosen position) and choose Insert copied cells. You can move rows just as easily. To insert a row in a new position; Cut the row, then right-click the row number below where it is required.

Q I use an Excel workbook to keep track of my finances. However, I've recently found that my workbook refuses to load. As this is such an important file, is there any way I can recover the data, if not the Excel file?

Ian Bell

A As luck would have it, there are detailed instructions on recovering data from damaged workbooks on the Microsoft KnowledgeBase. The address you need



Recover data, with KnowledgeBase's help

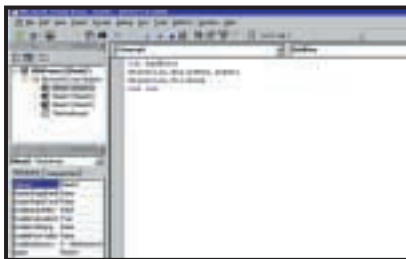
is <http://support.microsoft.com/support/kb/articles/Q179/8/71.asp>.

Q I want to know if it's possible to write a macro that adds a new row with a repeat of the contents of just one cell?

Laurence Jones

A I suggest the following:
Sub AddRow()
 Selection.EntireRow
.Insert
 Selection.FillDown
End Sub
(Key: ✓ code string continues)

Press Alt and F11 together to open the VBA for Excel editor and enter this listing. You could give it the keyboard shortcut Ctrl, Shift and R (for Row). To do that, press Alt and F8 together and choose Options. Now if you click in, say, cell C14 and run the macro, a new row will be inserted. The new row will be empty except that the new cell C14 will repeat the contents of cell C13.



A macro to add a cell with repeated content

Word

Q I use Word 2000 with Windows 98 SE. If I use the field 'page X of Y' it appears correctly on the screen, eg '1 of 20', '2 of 20', but prints as '1 of 1', '2 of 2'. Do you know how I can fix it?

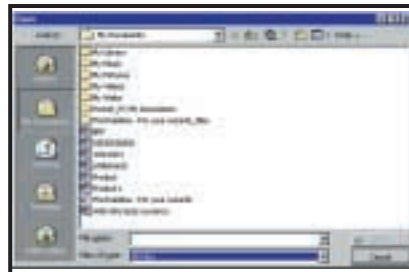
Roberta Gallini

A This, apparently, is number seven in the Word support top 10 queries, and it's down to a bug in the numpages field in Word 2000. It's fixed in the service release (SR/1, SR/1a) that you can get from the Office Update site. If you don't use Auto Update, go to Word's Help menu and select Office on the Web.

Microsoft also suggests several temporary workarounds. These include explicitly selecting the range of pages to print, rather than selecting the All pages option; turning off the display of non-printing characters (Tools, Options, View then clear all formatting marks); turning off background printing (Tools, Options, Print) and printing in reverse order (File, Print, Options). For the full story, have a look at <http://support.microsoft.com/support/kb/articles/Q234/2/87.asp>.

Q When I try to open a Word 97 document in Word 2000, the formatting gets lost. Instead, the formatting codes appear at the beginning and the end of the actual text. Have I gone soft in the head or is this Gates and co attempting to force the whole world to upgrade?

Lars-Peter Dorf-Larsen



Don't worry – it's not a Gates conspiracy

A Neither – it's a sneaky habit of the Word Open dialog box that has a 'sticky' setting for Files of Type. You will get the symptoms described if you open a Word document with this set to Recover text from any file.

Q I've created a macro in a Word 2000 document and would like to use it in another document. How can I do this?

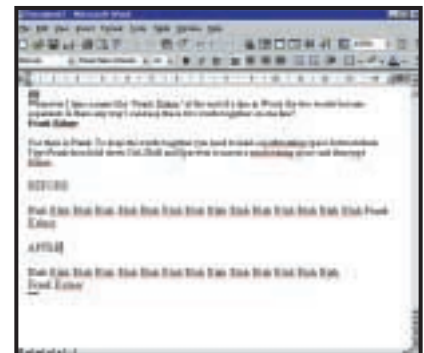
Peter Eccles

A All you need to do is copy your macro to your new document. To do this, click Templates and Add-Ins on the Tools menu, then click Organizer, and select the appropriate tab. In the In DocumentName box, close the

document or template if necessary, and then open the file from which you want to copy an item. Do exactly the same thing in the To TemplateName box, only this time, open the document or template to which you want to copy an item. In the In DocumentName box, scroll down until you find the item you want to copy, click the item, and then click the Copy button. The item will then be added to the other document or template. This works for styles, AutoText entries, toolbars or macros.

Q Whenever I type a name like 'Frank Kelner' at the end of a line in Word, the two words become separated. Is there any way I can keep these two words together on one line?

Frank Kelner



Insert a non-breaking space between the words to keep them together

A Yes, there is Frank. To keep the words together you need to inset a non-breaking space between them. Type Frank, then hold down Ctrl, Shift and Spacebar to insert a non-breaking space and then type Kelner.

Databases

Q I am trying to upsize a database from Access 2000 to SQL Server 2000 using the Upsizing wizard. Every time I run the wizard I get a really unhelpful error message that simply says 'Overflow Error'. What am I doing wrong?

Derek Makin

A Access 2000 was released more than a year earlier than SQL 2000. At the time of writing the wizard, the Access team did not have the necessary information about the internal structure of SQL 2000 to be able to include this upsize path. Having said that, given that Microsoft owns both products and the

operating system, you could be forgiven for expecting a more informative error message than this!

Q *I have many database files, all of which originate from MS Works V.4b. How do I put these .dbf and .wdb files into Access 97?*

Rod Stepney

A Open your database file in Works and make sure the field widths in the Form view of the database are large enough to display all the information in each field. Next, check the numeric format of your text fields is set to General or Text. If the format of any text field is set to a specific numeric format (currency, for example) that field will be blank when opened in Access. It's also worth making sure your field names are no longer than 10 characters – any longer and they'll be lost when opened in Access. Choose Save As from the File menu and enter a name. Select dBase IV from the Save File As Type list.

To import the database file into Access, load the program then open a new or existing database. Choose Import from the File menu and select dBase IV. In the Select File dialog box, select All Files from the List Files Of Type list box. Then, find and select your database file and choose the Import button. When the file has finished importing, Access presents a confirmation message box. Click OK.

Alternatively, you could just copy and paste your Works database file into Excel and then save it as an Access file.

Hardware

Q *I have a Gigabyte GA-6VX7B-4X motherboard with a Socket 370 interface. Am I right in thinking that an Athlon CPU can only sit on a Slot A or Socket A board?*

Mark Mitchell

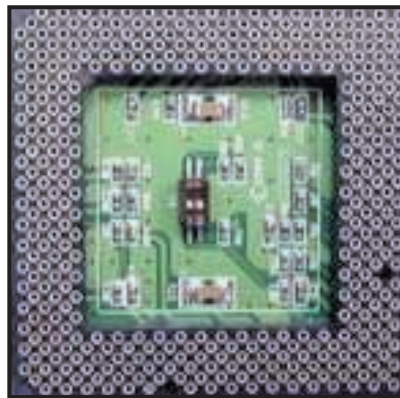
A The Socket 370 interface is employed for all Intel Celeron and the socketed Intel Pentium III processors – although all socketed PIIIs, along with the Celeron 533A upwards, require a Socket 370 which is FC-PGA compatible. When AMD switched back to sockets for the launch of its Duron and (improved) Thunderbird Athlons, it designed an interface with 462 pins called Socket A, which is totally incompatible with Socket

370. Earlier Athlons were also available in a cartridge form factor, requiring an interface called Slot A, which while the same size and shape as Intel's Slot 1, was electrically incompatible.

Q *In a recent Hands On Hardware you compared a new dual-FC-PGA motherboard with the classic Abit BP6. Is there any way the BP6 can take a pair of FC-PGA PIII CPUs?*

Richard Taylor

Yes and no. FC-PGA processors, which include all socketed PIIIs and Celerons from the 533A upwards, will not work in a legacy PPGA motherboard like the BP6. However, PowerLeap's Neo-S370 (www.powerleap.com) adaptor claims to run FC-PGA CPUs in older PPGA motherboards. We tried a pair but found



Neo-S370 claims to run FC-PGA CPUs

our BP6 unstable with one CPU and refusing to start with two. After conducting further tests with Sockets on a dual-Slot 1 BX motherboard, we've concluded that the BX chipset will not run dual FC-PGA CPUs. The BP6 looks destined to only run PPGA Celerons in dual configurations.

Q *Is it possible to overclock an FC-PGA Celeron 633 by using a 100MHz FSB?*

Stefan Gauntlett

The theory is sound, but the practice sadly unlikely. The Celeron 633 uses a 9.5 times multiplier, which would result in the chip being driven at 950MHz using a 100MHz FSB. In theory, this is just within the capabilities of Intel's manufacturing process, but it's a big push for a chip only rated at 633MHz. Remember that you may need to slightly increase the core

voltage by 0.05V or so for stability, and that such increases will demand better cooling.

Q *I currently have a PII 400 on a BX motherboard. What's the fastest processor that my board will take with the least modification?*

Denry Machin

A The BX chipset will talk to all Celerons and Pentium IIIs, and if you choose a chip slower than the Celeron 533 (not the A version) or slower than the Pentium III 600 (not the E, B or EB versions), then you won't need to change any voltages either. If you're going for a PIII, then look for a Slot-1 model below 600MHz without an E or B on the end. Any Celeron up to the 533 (but not A) will do, but you'll need a Slocket adaptor for it. Note that your PII 400 uses a four-times clock multiplier, which you will need to change if going for a faster CPU – there'll be instructions with your motherboard, which may also need a BIOS update.

Unix

Q *Some of my fonts look a bit funny when I boot Linux Mandrake 7.1 – certainly a lot worse than they look under Windows on the same machine. Is there anything I can do about this?*

Jeff Cawley

A Yes, there is, although I have to admit that the Windows fonts will still look better. The new version of XFree86, version 4.0, can now handle Windows-style TrueType fonts, but it still doesn't (yet) have a way of doing font anti-aliasing (which rounds out diagonal 'jaggies').

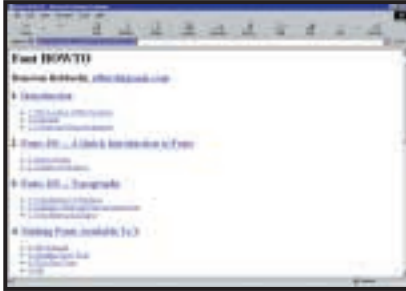
Your version of Mandrake comes with the pre-TrueType XFree 3.3.6, but can work with TrueType fonts because it includes the xfs font server. As this is the case, one of the things you could do to improve font display is borrow the TrueType fonts from your Windows installation and install them in a Linux directory called, say, /usr/share/fonts/ttf (which may be there already).

To make these known to xfs, you'll need to run a utility inside the TrueType font directory called /usr/sbin/ttmkfdir, which creates the appropriate font list. And if the TrueType font directory is new, you'll need to add it to the font



list that xfs expects to find in /etc/X11/fs/config. Now you'll have to restart xfs (/etc/rc.d/init.d/xfs restart).

Sounds a bit long-winded? Mandrake thought so too, so it has included a graphical utility, DrakFont, to do the job



How To has all the font info you need...

for you, including copying the TrueType fonts from your Windows installation.

For the full lowdown on fonts, TrueType and otherwise, check out Donovan Rebbechi's excellent How To at www.linuxdoc.org/HOWTO/Font-HOWTO.html.

Graphics & DTP

Q I have a box of 6 x 6 and 6 x 9 black-and-white negatives dating from the 1920s and 1930s (mostly family snapshots), but all the prints have been lost. They are of variable quality and it would be too expensive to have prints made, so I would like to scan these and touch up using the usual methods.

I have not seen any magazine articles on the methods of scanning and results one could expect. A few flatbed scanners are advertised claiming to scan negatives. I can afford to pay around £200 for a suitable one – can you recommend one to do this job?

John Hartley

A You need an A4 flatbed scanner with a transparency hood which will backlight the negatives. We recently reviewed the CanoScan FB1210U, which, at £249 excluding VAT, produces superb results from large-format colour transparencies.

Black-and-white negatives are often difficult to get good results from because of the compressed tonal range involved. The FB1210U is a 36-bit scanner so, with 12-bits per channel, it can generate 4,096 levels compared with only 256 that a 24-bit (eight bits per channel) scanner would produce. Even so, you might get better results by scanning in RGB mode and converting to greyscale.

Q I am looking for a package which will allow me to produce birthday cards, wedding invitations, hymn sheets and the like.

I have already done a little work on this using Sierra Print Artist and have incorporated my own photographs into my designs. In fact, I was able to produce all of my daughter's wedding stationery.

Now I am looking for a new package that is very similar to Print Artist but with more graphics, photos and ready prepared designs that can be edited. I do not want a package that is too American styled, and my limit is £50. Am I asking too much?

Susan Chipchase

A Yes and no. Two packages that did well in the last PCWgroup test were MS Publisher 2000 and Printmaster Home Premier 8. You can find out more about them by ordering our March 2000



Publisher 2000 features a number of Wizard-led publications

back issue (call 01858 43885 or there's a faxback service – dial 09065 600 632 on your fax and then enter code 2000 to receive a list of what is available).

Alternatively, check out Publisher 2000 at www.microsoft.com/office/publisher/ where you will find lots of details (but unfortunately no trial download).

If you're interested in Printmaster, I recommend you call Mindscape on 01444 246 333 as the Mattel website which Mindscape's URL points to has no mention of the product. Both cost a little more than your £50 limit, but the quality is well worth the extra.

Q Whenever I save a file in Photoshop, the file's icon becomes a miniature version of my image. Is there any way I can do this for other types of image file?

Bill Whittingham

A By default, you can view iconic previews of icon (.ico), cursor (.cur) and animated cursor (.ani) files.

However, you'll be pleased to know you can apply iconic previews to bitmaps, too. Simply run the Registry Editor (regedit.exe) and navigate to HKEY_CLASSES_ROOT\PAINT.PICTURE\DefaultIcon, and change the (Default) value to %1.

You may run into problems if you've associated .bmp files with a program other than the Windows Paint program. If this is the case, replace PAINT.PICTURE with whatever program you have associated with bitmap images.

If you decide you no longer want iconic previews of bitmaps, run Explorer and select Options from the View menu. Now click on the File Types tab, find the bitmap file type in the list, click Edit and then Change Icon.

Visual Programming

Q I've recently started working with Visual FoxPro 6.0. My program needs to work with an Access .mdb. I want to automate Access to export a particular table to dBase III format so that VFP could take over, but all the code samples are for VB.

Charitha Smith

A Automation is a great feature of Windows, but it can be hard to puzzle out the correct syntax. Two great tips are to exploit macro recording in Microsoft Office, and the Object Browser in Visual Basic and Visual Basic for applications. Using these, together with samples and object models in Microsoft's documentation, usually gets things working.

In this case there is no need to automate Access, nor to export to dBase III. The easier solution is to use DAO or ADO to read the data directly from FoxPro. Figure 1 in the Visual Programming column, page 295, shows some example code, which should be easy to extend using the DAO documentation for Visual Basic. In this case, I got the constants such as dbOpenTable from VB object browser. Another tip is to install the latest MDAC (Microsoft Data Access Components) from www.microsoft.com/data.

CONTACTS

All of our experts welcome your queries, simply respond to the appropriate address at the end of their *Hands On* columns.



Share and share alike

You can avoid the stress and hassle of travel by holding your meetings online, says Terence Green

Driving or flying to meetings is fine if you like travel or must meet face-to-face, but the Internet delivers meetings online, which is not only cheaper, but in many cases a much better use of human resources.

There are numerous ways of holding online meetings, from web-based online meeting rooms to dedicated conferencing software. In between, there is the Office 2000 online meeting, a loose collaboration between Office 2000 and Microsoft's free NetMeeting software. Technically speaking, NetMeeting supports the International Telecommunications Union (ITU) H.323 audio/video conferencing and T.120 data conferencing standards. Since NetMeeting itself only supports one-to-one video/audio, H.323 is of little use to group meetings, but T.120 data conferencing enables groups to gather online and share applications and data, engage in text chat and exchange files.

NetMeeting itself provides all the data-sharing facilities a group needs. The Office 2000 online meeting is grandiose

One person hosts the meeting, the others join and sharing can begin – it's a doddle

marketing lingo for basic automation enabling NetMeeting conferences to be triggered from the menu bar of an Office 2000 document. The meeting organiser can use Outlook 2000 to send out invitations in advance and start NetMeeting shortly before the meeting, so that it's ready when the attendees come calling. Outlook 2000 also allows the person hosting the meeting to specify a particular document to be opened for sharing when the meeting starts. Frankly, Office 2000 online meetings offer a modicum of automation to corporates that have deployed the whole Office 2000/Exchange Server package. The rest of us can simply publicise the time of the meeting via email or phone and either



NetMeeting 3.01 can be downloaded from Microsoft's website

call participants or wait for them to join much more easily.

There are some issues affecting connections between NetMeeting users. First, if your Internet connection passes through a software proxy, a NAT router or a firewall, others may have difficulty finding you. The latest version of NetMeeting has been out for over a year now so the suppliers of your proxy, router or firewall should be able to advise if and

how it supports NetMeeting. Next, how do you know if someone is online? Microsoft used to run directory servers but dropped these some time ago and now recommends the MSN Messenger service. This is a good policy because you can see whether your prospective meeting members are online and, if so, connect to them by name rather than having to worry about addresses.

If you want to try the NetMeeting directory service, to which NetMeeting still defaults because Microsoft never bothered to update the package after dropping its servers, you can locate public directory servers from links at www.netmeet.net and www.meetingwire.com. Finally, you can simply

hit the call button and enter an IP address. If you're the host of a meeting you can find your IP address in the Help, About NetMeeting window and email it to participants. However, if you're the meeting host and your IP address is in the 192.168.x.x range, your computer is invisible to anyone

coming in from the Internet. People on your physical network should be able to contact you, but you'll have to use MSN Messenger or a directory service to enable outsiders to find you. Alternatively, let someone with a real IP address act as the meeting host.

NetMeeting is very easy to set up. It runs on Windows 95, 98, NT4 and 2000, and requires the TCP/IP networking protocol. On Windows NT4, install Service Pack 4 or later. There are a few versions of NetMeeting around and you can make life easier by standardising on NetMeeting 3.x, which is included as part of Windows 98 and 2000 and is also part of the standard Internet Explorer 5.x package. You can also download NetMeeting 3.01 (it's under 2MB in size) from the Microsoft website (www.microsoft.com/netmeeting), but note that it needs Internet Explorer 4.01 or later.

It helps if everyone uses the same language setting and keyboard; differences may cause the data sharing, whiteboard and chat features to misbehave. Varying screen resolutions and colour depths are OK, but be aware that a high-resolution image may not make much sense to someone running at 256 colours. That's why it's best to make any changes to resolution and colour depth before starting NetMeeting.

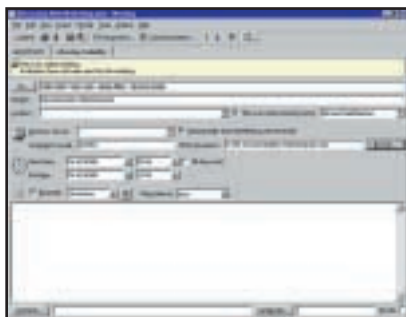
Forget video and audio in a group conference. You can only share video and



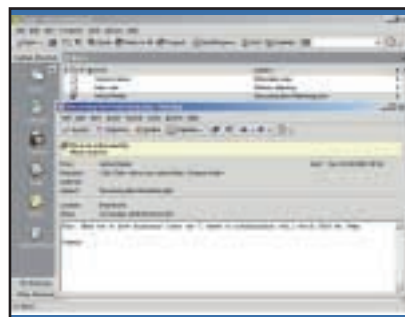
NetMeeting in action



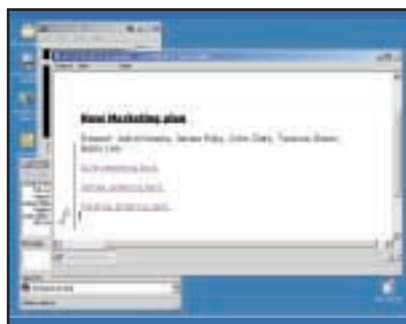
1 A group of people need to fine-tune a report outlining a new marketing plan. To save time, the group decides to meet online with NetMeeting. Once gathered in their online meeting, the group will use all the features of NetMeeting – including application sharing (to share the Word document), chat to discuss their progress in real time, the whiteboard to illustrate ideas for general comment, and file exchange to transfer relevant files between participants.



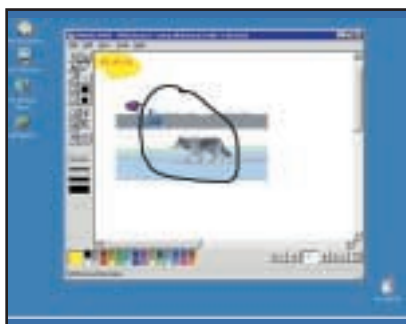
2 Outlook 2000 can be used to schedule meetings and invite participants to take part. From the File menu, select New and then Meeting Request. Tick the This is an online meeting box and leave the selection at NetMeeting. To open a specific Office document for sharing, enter its name in the Office document field. Set a start time for the meeting and, if desired, a reminder. You can also set NetMeeting to start automatically at the reminder time.



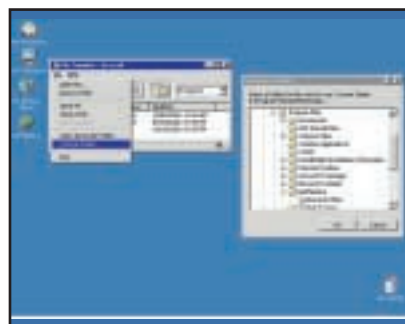
3 When you receive an invite (denoted by the heads with envelope icon) in Outlook, you can Accept or Decline. If you aren't using shared schedules (which allow the host to check your free time), you can click the Calendar icon in the shortcut bar to see whether the meeting time conflicts with your schedule. You also have the option of Tentative acceptance. The host receives your response with either Accept, Decline or Tentative prefixed to the Subject.



7 Multiple users must take turns to edit a shared document. Document tracking features don't distinguish between different participants because the document still resides on the sharer's system and is being remotely edited. However, the title bar shows the document owner and the name of the person who currently has control. When someone completes an edit they can either relinquish control to the document owner or forward control to another user.



8 The whiteboard (third icon from left at the bottom of the NetMeeting window) is a space that everyone can use and see simultaneously. It allows multiple pages, and text or images can be cut and pasted from your desktop or programs to the whiteboard and vice versa. Use the highlighter or the remote pointer to draw attention to specific items on the whiteboard.



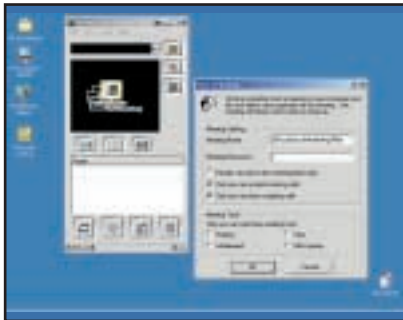
9 With Transfer Files (the last button at the bottom of the NetMeeting window), you can transfer a file or files to one or more of the other participants in the meeting. Select the files you want to send by dragging them into the Send window or by selecting them from the Browse window. By default, files are saved to the Program Files\NetMeeting\Received Files folder, but you can change the location from the File menu of File Transfer.

audio with one other person and it will slow down your data sharing, especially at modem speeds.

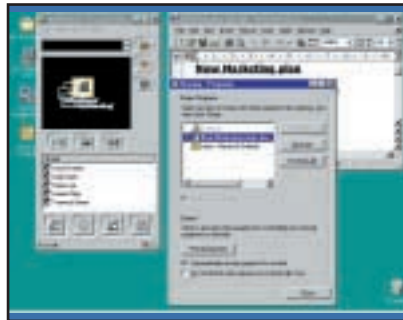
With NetMeeting running, setting up meetings is a doddle. One person hosts the meeting, the others join and sharing can begin. Four large icons on the NetMeeting panel initiate application sharing, chat, whiteboard and file

exchange. The host can reserve these features or allow everyone to initiate them. The host can also control who joins or allow any of the participants to invite others in. Everyone can edit or use a shared document or application (but only one at a time), round-robin fashion. Chat and simultaneous real-time text messages come in useful as participants

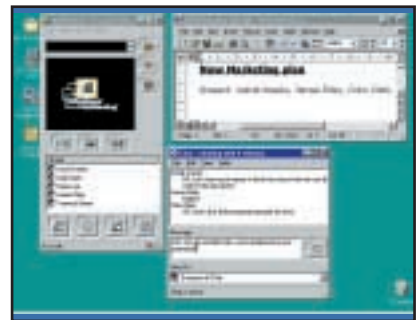
can discuss who will do what and when on the shared document. The whiteboard is like a shared clipboard for all to cut and paste text and images or to draw and write simultaneously. A single user can reserve it for private use so that others can view it but not write or draw. File exchange allows you to send a file to selected or all meeting participants.



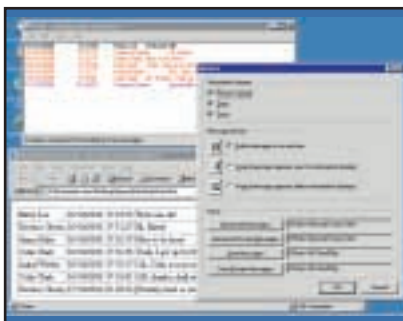
4 Assuming you aren't using Office 2000 semi-automation and have notified the prospective participants of the meeting, you can either let the meeting begin *ad hoc* or take control by selecting Host a Meeting from the Call menu. The Require security option encrypts all of the data traffic between participants. For extra security, each participant can be required to provide authentication, but for this level of security each person requires a digital certificate.



5 Open the document you wish to share – for example, a Word 2000 document. When all participants have joined, click on the leftmost (Sharing) icon at the base of the NetMeeting window. The Sharing Programs window allows you to choose which applications or documents to share, and whether others are allowed to control them. Multiple programs or documents can be shared, but this can slow response times and become quite confusing.



6 The chat feature (second icon from the left at the bottom) is the easiest way to manage the progress of the meeting and decide who will take control of the shared document next. Once started, everyone sees the chat window (unless they close it) and everyone can send messages to all the others or to selected participants. If the meeting is using security, then the chat messages are also encrypted during transmission.



10 As the meeting comes to a close you may want to save the whiteboard and chat files for future reference. Chat options (View, Options) such as date and time stamps are useful when saving the proceedings as an official record of a meeting. You can save the chat trail as an HTML file, which will display as a table in a web browser. Unfortunately, you cannot easily separate public and private chat messages.



11 Having used the secure meeting mode, if you want to stay online and use audio and/or video to discuss the success or otherwise of the meeting with one of the other participants after the others have departed, you have to begin a new meeting as audio/video is not enabled while you are in a secure meeting. If necessary, kick off anyone who has forgotten to leave the meeting by right-clicking on their name and selecting 'Remove'.



12 Audio/video conferencing, together with the saved whiteboard and chat log, allows you to review the meeting informally and to appraise the contributions of the participants.

Sophisticated it ain't, but NetMeeting is free and very effective for *ad hoc* meetings. It also works with other H.323 and T.120 products and you can call into an H.323 multipoint conferencing unit (MCU) and engage in group video and audio conferencing. For a more advanced range of H.323/T.120 conferencing products, have a look at

CUseMe at www.cuseeme.com or PictureTel at www.picturetel.com. If you don't need video, have a look at web collaboration systems such as SameTime and eRoom (see Contacts box).

For a list as long as your arm, run an Internet search on Google (www.google.com) using terms like 'web conferencing groupware'.

CONTACTS

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win2000@pcw.co.uk

SameTime: www.sametime.com

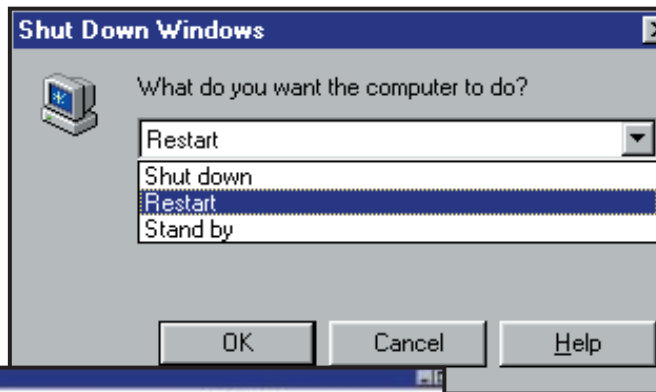
eRoom: www.eroom.net



Environmental health

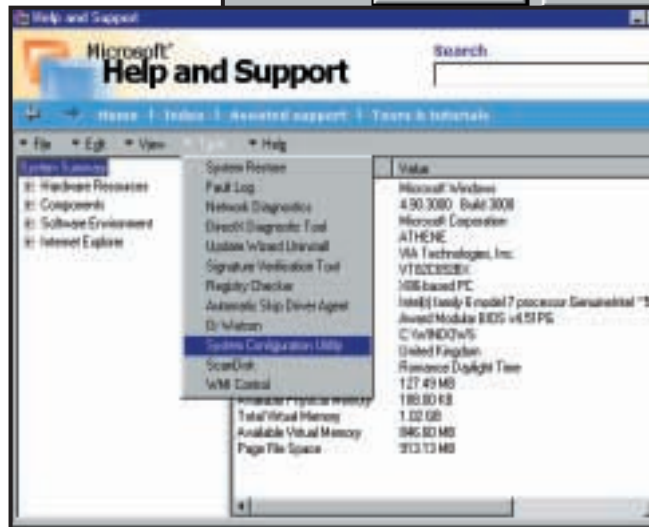
Tim Nott tracks down the System Configuration Utility and offers tips on password caching

You may have noticed that this month's *PCW* is dated January 2001: the date that pedants the world over maintain is the real start to the millennium. Not least of the pedants was a well-known broadsheet newspaper, which, last January, ran headlines such as 'All those fireworks went off by accident' and 'Millennium Dome a big mistake' – well perhaps they got that last one right. So, welcome to Windows Millennium Edition corner. Just remember, two of each consonant and you'll be all right on the spelling. Microsoft seems uncertain what to call it: Millennium Edition should logically be ME just as Second Edition is SE and what once stood for New Technology is NT. The packaging, however, calls it Windows Me. This, presumably, is not so much a tribute to the 'me generation' – hey, that was last century – but new infantilism. First we had My Computer, which made its debut with Windows 95. Everyone at the time thought this was a pretty silly name, but this didn't deter Microsoft, which followed up with My Documents in Windows 98. Somehow, during the reign



Left: So, farewell then, 'Restart in MS-DOS mode'

Below: Digging out the System Configuration Utility



known as the marginally less silly Network Neighborhood. This is all a plot, I feel sure, to reduce our conversational level to that of a three-year-old. 'My Computer! My Network Places! Go 'way! Me! Me!' (Throws mouse on floor, sucks thumb and sulks.)

Anyway, back to the plot. As I mentioned last month, MS-DOS mode is

drop list. This has already caused problems – as in Windows 2000 – when applying BIOS updates. Intel has produced a utility that will make a pseudo DOS boot disk to get round the problem, and as that's a hardware problem, I'll say no more.

But what about the environment? No, not trees and grass, but system variables, such as where the Temp folder lives, and what keyboard language settings DOS windows should use. These were stored in config.sys and autoexec.bat, which is the way it's been done since pre-Windows days. Now, with the death of MS-DOS mode, these two have

been retired after nearly two decades of faithful service. It's all rather sad, a bit like losing one's butler and gardener in the same week. But the practical question is: what has taken over the job of polishing the silver or rather, setting language and environmental variables? The good news is that we aren't saddled with the defaults of an immovable Temp folder and disappearing pound signs. Two new pages have been added to the wonderful System Configuration Utility, allowing you to edit the environment variables and international settings used by non-Windows applications. Finding the System Configuration Utility itself is a challenge: if you go to Start, Programs, Accessories, System Tools, you get what appears to be a new-style help file. But if you look carefully it has a Tools menu, which contains a shortcut to the SCU. Secondly, you can continue, as I did, to type msconfig in the Start, Run box.

config.sys and autoexec.bat have been retired after nearly two decades of faithful service

of Windows 98 and Office 2000, these were joined by My Music, My Webs and My Pictures. If I've missed any, I apologise, but please don't feel you have to tell me about them. Now, Windows Me brings us My Network Places, formerly

no more: these days DOS runs inside Windows. You won't find it as an option either on the boot options or the shutdown options – the latter, for some inexplicable reason, has replaced the one-click option buttons with a two-click

Another welcome new feature is in the standard File Open/Save dialogs used by the Windows applets. The previous version not only started in My Documents, whether you wanted it to or not (see November's *Hands On Question Time* for a workaround), but also gave you a very useful shortcut to the contents of the Desktop folder from a toolbar icon. The new dialog goes much further, with an Office 2000-style vertical places bar, leading to History, Desktop, My Documents, My Computer, My Network Places and My Playpen. All right, I made that last one up, but it's a great relief that if you rename the corresponding folders from the Desktop or Explorer, the changes filter through to this dialog. Sadly, nobody seems to have told WordPad about the change, and it continues to limp along under the old system, even minus the Desktop shortcut button.

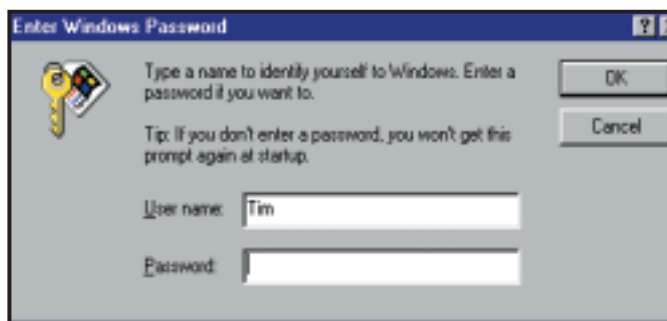
Duncaching

Meanwhile, for those of you with Windows 98 – or even the ultra-unfashionable Win 95, this month I'm going to go on about a subject that never seems to drift out of the top 10 for long, namely Windows' amnesia when it comes to Dial-up Networking passwords. The usual symptom is that the DUN box appears, but not only are the username and password blank (or the former incorrect) but the 'Remember my password' check box is greyed out, even after you've filled in the correct details.

The central issue is that for password caching to work, Windows needs to know who you are: that is you must be logged on. So first go to Control Panel, Networks (yes, even if you are not connected to a Network). Check that 'Client for Microsoft Networks' is installed: if not, Add, Client, Add, Microsoft, Client for Microsoft Networks. Windows 98 users can also add Microsoft Family Logon. OK, back to the main Networks dialog, and under Primary Network Logon, select Windows Logon or Microsoft Family Logon. At some stage in this procedure you may be prompted for the Windows installation CD-ROM.

Next, restart the computer and you

will get a prompt to log on with a username – by default the one you used to set up Windows – and a password. If you cancel this dialog you'll be logged on as a default user and remain anonymous. If you enter a username and password then you'll be properly logged on and password caching should work. Now, if you don't have user profiles enabled – perhaps you are the only person using that PC or a member of a group or family that all use the same settings – you may not want the hassle of typing in a password each time you use the PC. So, instead of cancelling this dialog, just leave the password field blank: this will give you a null (but valid,



Finding a cure for Windows password amnesia

for caching purposes) password. Note that you can't have a null password if you have user profiles active.

You should now be able to save your DUN password. If not, there are further troubleshooting steps you can take. First,

Notepad.exe can no more trigger a dial-up than Windows Paint can ride a bicycle

your password cache file may be corrupt. Look for a file named <user>.pwl in the Windows folder, where <user> is the name Windows knows you by. Rename it and restart. Another possibility is that rna.pwl is damaged: you should only have this if you've installed the DUN

server that allows other computers to dial in to yours. Again, the procedure is to rename and restart.

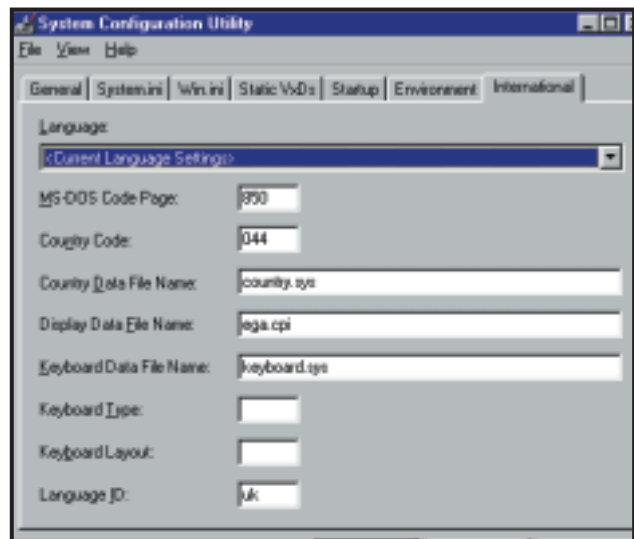
Another possibility is that password caching has been disabled on the PC, as a result of using the System Policy editor.

You can check this by running regedit and going to: HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Policies\Network. If password caching is disabled, then there will be a DisablePwdCaching DWORD entry in the right pane with a value of one. Change its value to zero, close the Registry editor and restart.

Another Registry entry may also be to blame, this time at: HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Network\Real Mode Net. A binary entry named AutoLogon in here will prevent

password caching – delete it.

Finally, should all else fail, it may be that one of the files used by Dial-up Networking is damaged, so try removing DUN from Control Panel, Add/Remove, Windows Set-up, where you'll find it under the Communications component.



Filling the gap left by the DOS start-up files



Restart, then repeat the Windows Set-up routine to reinstall DUN.

Yet another mystery

Another DUN favourite is the phantom dialler. We've had several dealings with this slippery customer over the past few years, but it seems to have a new incarnation. A member of a Windows newsgroup, who prefers to remain anonymous, noticed that the Dial-up Connection box was appearing every time he started Windows. In addition, his system seemed to have slowed down.

Among the jocular suggestions, 'Had he recently upgraded Internet Explorer?' was the rather more sensible one – it was recommended that he install ZoneAlarm to try to identify the program instigating the dialling. So he did, and the culprit was found to be Notepad.exe. Now, you don't have to be a Windows expert to realise that Notepad can no more trigger a Dial-up than Windows Paint can ride a bicycle, so obviously something was wrong.

Stranger still, Ctrl & Alt & Del showed that Notepad.exe was running, but it wasn't visible anywhere on the desktop. Even more ominously, his version of Notepad.exe weighed in at 120KB instead of the usual 34KB (Win 95) or 52KB (Win 98). It turned out that a variant of the W32/QAZ worm had replaced the original, renaming the latter to Note.com. Getting rid of it is relatively simple: delete any 120KB copies of Notepad.exe, rename Note.com to Notepad.exe and delete the following Registry entry:

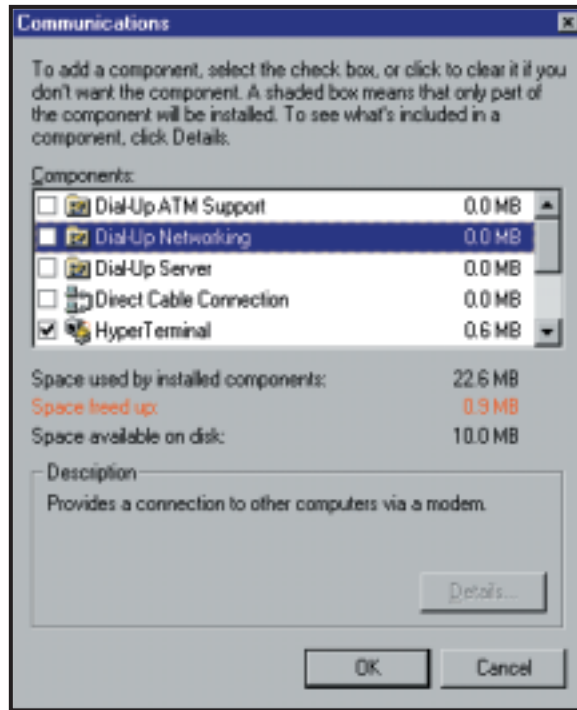
```
HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Run\StartIE=C:\WINDOWS\notepad.exe qazwsx.hsx.
```

You'll find further details on the McAfee website at http://vil.nai.com/villib/dispvirus.asp?virus_k=98775.

Any other business

Here's another tip from the irrepressible Alex Pounds. If you hold down the Shift key while selecting an item from the Start Menu, the latter stays open. Not only does this mean you can start multiple programs, but it also gets rid of the infuriating problem of the Start Menu suddenly disappearing as a slow-to-load program starts.

Way back in May 1999, we gave a blow-by-blow account of Direct Cable Connection and I wrote 'Please don't



A last resort for DUN problems

write in asking if you can connect two PCs by their USB ports. You can't – and since USB cables carry power as well as data, you risk blowing up one or both PCs.' Jaspal Banga, backed up by no lesser an authority than our very own Gordon Laing, informs me that this is no longer true.

Jaspal bought a special Belkin cable for £60, and transferred 80MB in just four and a half minutes – a lot faster than I was able to achieve over a parallel connection. Gordon also notes that you can get a special USB cable from Laplink for around £30, but you will also need a copy of the Laplink software: you can't use the cable with Windows DCC.

Now, here's a question for you. Is it possible to remove almost all traces of Internet Explorer from Windows so you can use Netscape Navigator instead? It's a tricky question all right and one that has not only occupied the time of the US Department of Justice but also David Crossman who hails from Coventry.

The good news, as David found out, is that you can remove Internet Explorer from Windows (and not just by breaking up a major software corporation through the courts). All you need to do is navigate to www.98lite.net and download the shareware program, 98lite Preview Edition. This program allows you to select a 'Slim', 'Chubby',

or 'Lite' install of Windows. The first option allows you to remove the program almost entirely while the latter two options allow you to disintegrate your web browser from your Desktop (although you can keep Internet Explorer for web browsing). The program will work on Windows 98, Windows 98 SE and also has support for Windows Me which will be expanded in a future release. Best of all, there are no nag screens.

As the deadline for this column loomed your first responses to the 'Find a mascot for Windows' challenge

started to trickle in.

David White suggested a polar bear, as 'everybody knows that polar bears eat penguins'. Whereas I wouldn't blame David for sleeping through geography classes, 'everybody' knows that penguins and polar bears are, quite literally, poles apart, making it rather unlikely that the latter are part of the former's diet.

Also on an icy theme, Philip Seal suggested three brass monkeys (but I think he meant wise monkeys): 'Hear no evil; see no evil and of course speak no evil. Not exactly cuddly but shouldn't we adopt that approach?' Well, bonus points for the correct use of a semi-colon but I can't really see what this has to do with Windows.

Peter Steele suggested a vulture: interesting, but doesn't really fulfil the 'cute and cuddly' requirement specified in the brief. Sean Butler-Lee did rather better, by suggesting Mister Bump from the *Mister Men*: 'Even though he's been patched loads of times, he still keeps falling over.' I rather like that one; keep them coming.

CONTACTS

Tim Nott welcomes your comments on the Windows column. You can contact him via the PCW editorial office or email: win@pcw.co.uk. Please do not send unsolicited file attachments.

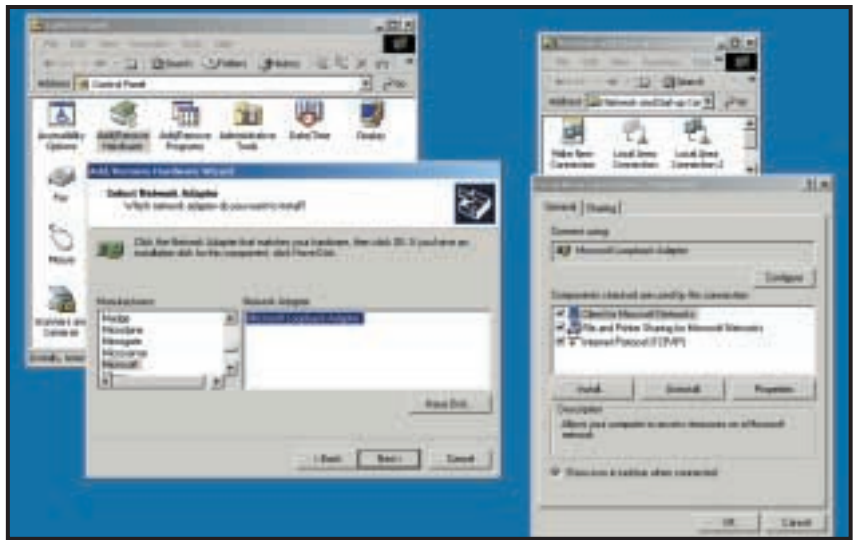


Lowdown on backing up

Terence Green cuts through the confusion surrounding the use of CD-R and CD-RW for backups

Ever wished you hadn't made a throwaway remark? I had that feeling twice after including snippets of information in past columns without explaining them in greater detail. In October I mentioned a reader's tip for using CD-R and CD-RW drives for backup. This has proved to be more than a little confusing for some readers. Then, in replying to a November *Question Time* enquiry about enabling DMA in Windows 2000, I briefly mentioned that UltraDMA66 is not enabled by default and pointed to a Registry fix in KnowledgeBase article Q247951. Again, this deserved more explanation. Apologies all, but a further explanation follows.

The UltraDMA66 fix, as you'll see if you look up the KnowledgeBase article, only works for Intel chipsets – the support chips that provide interfaces to motherboard resources such as IDE channels and so forth. I'm afraid that my quick comment gave false hope to people with motherboards based on VIA chipsets. Most motherboards in Windows 2000 systems are based on Intel chipsets, usually the venerable BX, and the KnowledgeBase fix is appropriate for them but a growing number of us run AMD systems or systems supporting PC133 memory. These are largely based on VIA chipsets and the KnowledgeBase fix, while it won't cause any problems for



Add the Microsoft Loopback Adaptor to make the backup work

VIA chipsets, won't enable UltraDMA66. All you can really do if you have a VIA chipset is to go to www.viatech.com and download the latest 4-in-1 driver package. This gets better as time goes by and the latest version, 4.25, does successfully enable UltraDMA66. Well, at least it does on my system, an Abit KT7-RAID motherboard with a Duron processor.

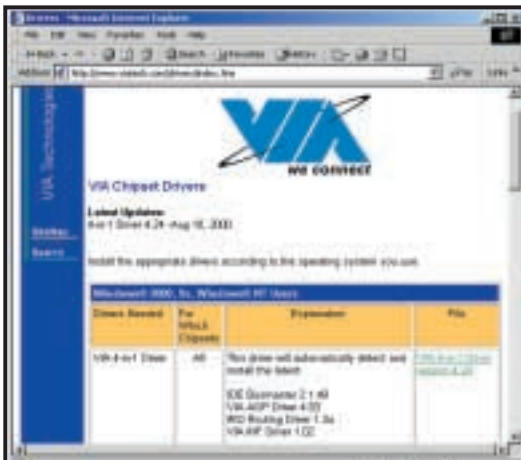
I still have some issues with the VIA drivers but, as Ryan Lindsay wrote to explain, people with motherboards based on older VIA chipsets may not be able to get UltraDMA66 support working even with the latest 4-in-1 drivers because of limitations in the BIOS and that's down to the motherboard manufacturer. I'm quite happy with Abit motherboards but others swear by Asus. If you're in the market for a new motherboard it's well worth visiting motherboard sites like www.tomshardware.com and www.overclockers.com to see what people are saying about various motherboards. I'm not suggesting that you overclock your CPU (or that you don't!) but as overclockers tend to stress the hardware, a board that reacts

well to overclocking and is widely used is likely to be a better deal than a board with an obscure name.

Backup to CD-R and CD-RW

My main issue with the VIA chipset now is that my Plextor IDE CD writer goes ga-ga if I run it with DMA enabled. I discovered this while trying to sort out why some readers have been unable to back up to their CD writers. Normally you shouldn't be able to do this anyway. The Backup utility provided with Windows 2000 is a freebie version of Veritas Backup which specifically does not support writing to CD-R or CD-RW media. But, as a reader wrote in to explain, by sharing the CD writer and then mapping a drive letter to the share you can back up to CD-R or CD-RW media. The tip works because, although Windows 2000 Backup detects the CD media and refuses to write to it, when the CD media is presented as a network share or mapped drive letter, even though it is on the same machine, Backup happily writes to it. Nice!

It worked for me so I passed on the information, only to be assailed by readers for whom it didn't work! Again! What I hadn't realised was that it worked for me because I tried it on a fully networked system. If, for any reason, this

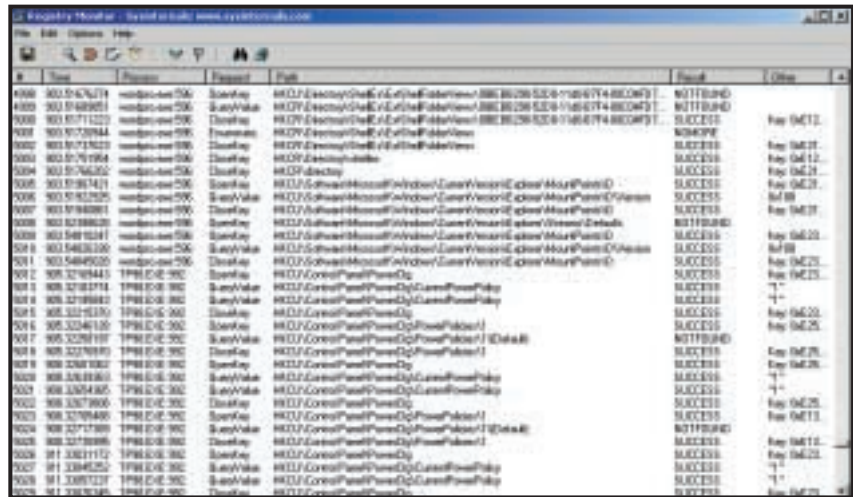


Bump up the VIA volume with the latest VIA 4-in-1 drivers

tip doesn't work for you, the workaround is to install the Microsoft Loopback Adaptor. This creates a simple virtual network. It is designed for developers who want to test networking code on standalone systems and shouldn't cause any problems. If it does, it's a simple matter to remove it. The Loopback Adaptor trick may even be needed on a networked system. There are numerous reasons, all related to specific configurations, why this might be necessary and not enough space to explain them all in detail. Similarly, I recommend using the net use command from a command prompt to create the mapped drive. You may be able to do it all from the graphical user interface but there are numerous circumstances in which it won't work but the net use method will. So, here are the step-by-step instructions.

Install the Loopback adaptor from Add/Remove Hardware utility in Control Panel. Choose to Add a device, wait for the detection to complete and select Add a new device from the Choose a hardware device window. Tell the wizard you want to select the hardware from a list. Choose Network Adapters and wait for the list to appear. Scroll down to Microsoft in the manufacturers list and add the Microsoft Loopback Adaptor. That's it. You don't even need to reboot.

Now open My Computer, right-click on the CD writer icon and select Sharing from the pop-up menu. Select Share this folder, enter a sharename, say 'backup', and click on OK to close the window. Now open a command window – Start/Program/Accessories/Command Prompt – and at the command prompt type: net view \\computername where



Registry Monitor from www.sysinternals.com can help you identify permission problems

'computername' is the name of your computer. If you're not sure of the name, right-click on My Computer, select Properties, and click on Network Identification to see the computer name. Net view should reveal a list of the shared resources on your computer including backup. Now, to map a drive letter to backup so that Windows Backup can write to it, enter the following command: net use x: \\computername\backup where 'x' is a free drive letter.

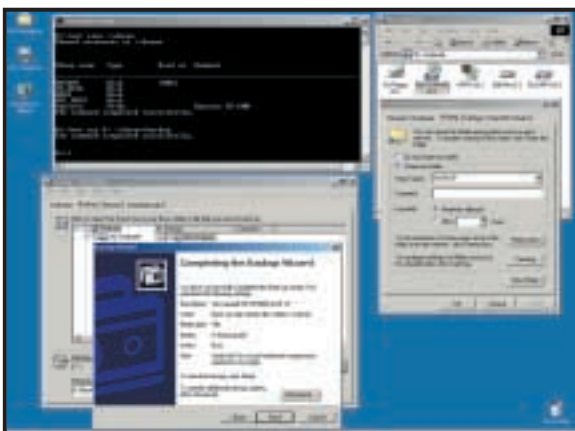
Providing you have packet-writing software such as Adaptec Direct CD installed you can now run Windows Backup, feed it the 'x' drive letter, and store your backups on CD-R or CD-RW media. Credit for originating this tip goes to Nick Tucker. Now all I need is someone to come up with a clever plan to get backups to span multiple CDs. Nick?

Readers deliver

Richard Steele came through with the answer to some puzzling problems with Office 97. Having installed Office with his Administrator group account, Richard set up his family as standard users but then discovered that, although he could use it, the Word spell checker would not start up under a standard user account. There were problems with Outlook as well. As Richard surmised, the problem is a security issue in that the Office components need write-access permissions, which

standard users, having fewer access rights than administrators, don't have. Richard found the answer to his problem in the KnowledgeBase at: <http://support.microsoft.com/support/kb/articles/Q257/6/43.ASP> for the spell checker and <http://support.microsoft.com/support/kb/articles/Q263/0/04.ASP> for Outlook.

It's best to install programs using an administrative account but it can lead to problems like the one experienced by Richard. It's always better to figure out why the program won't run rather than bypassing the problem by giving everyone administrator privileges. When this problem does arise it generally distinguishes well-written installation programs from those that are not fully compatible with Windows 2000 (or Windows NT for that matter). Sometimes a program fails in this way because it tries to access data file areas to which only administrators have been given access. At other times, as in the case of Office above, the program unsuccessfully tries to write to restricted Registry areas. With a bit of work you can track down Registry permission problems with Registry Monitor from www.sysinternals.com. RegMon is a tiny 50KB download. Fire it up, set it to filter Registry errors and run the program that is not working.



Backing up your hard drive to a CD-RW requires carefully navigating through several windows

CONTACTS

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Developing a six-pack

Roger Gann details the history of NT Service Packs – features upgraded, bugs introduced... oops

In last month's column I looked at the whys and wherefores of service packs, the software patches distributed by Microsoft to update Windows NT4. This month, I'm going to walk you through the six service packs that have been released so far, detailing their contents.

Service Pack 1 (1.5MB)

A few months after the release of Windows NT4, in October 1996, Microsoft released the first patch for its industrial strength operating system. No longer called Corrective Service Diskettes (a hangover from the company's failed relationship with IBM), the patches were now renamed Service Packs – presumably because they would no longer fit on a diskette. The first service pack was a modest, 1.5MB affair that fixed a smattering of minor bugs – the main code had no 'show stoppers' and the advice here was only to install it if you had actually experienced the bugs it sought to fix – 'if it ain't broke, don't fix it' being generally good advice. Among the dozen or so bugs it fixed was an intermittent file corruption problem, Winsock memory access violations, data corruption, a memory leak in IIS and an irritating bug in File Manager. It would also generate a stop message whenever an IBM Warp



Applying and managing the application of service packs across a network can be a nightmare – St Bernard Software's SPQuery considerably simplifies this task – see www.stbernard.com

Connect client tried to connect to Windows NT4, but I have a deep suspicion this was a 'feature', not a bug.

Service Pack 2 (14.5MB)

A mere four months down the road from SP1, Microsoft released Service Pack 2 in January 1997. 'Escaped' would be more accurate than released as the now notorious SP2 caused more problems than it fixed. Why? Because there was no proper beta testing prior to its release. As a result, quality suffered hugely and we all paid the price.

For the first install of SP2, the setup program asked whether to save uninstall information, which was just as well because most users could have made use of this facility. The uninstall process was a bit messy (for example, you had to save the uninstall information on your system partition), but having this option was a step in the right direction.

So, what was it supposed to do? One major fix concerned symmetric multiprocessing (SMP), which let users run NT4 on a computer with more than four CPUs without the computer periodically going

south. SP2 also fixed NT4 so that it replicated data properly from a Primary Domain Controller (PDC) to a Backup Domain Controller (BDC).

Surprisingly, Microsoft also added two new API calls to NT4, using SP2 as a delivery vehicle. These two calls, ReadFileScatter() and WriteFileGather(), let programs pull in data from an uncached file and store it in a discontinuous buffer, and vice versa. They also gave disk I/O-intensive applications such as SQL Server and Internet Information Server a serious performance boost because you could now move data from memory to disk in one pass.

That was the good news, the bad news was the number of new problems it introduced. The bugs ranged from amusing (it broke PPP connections to MSN) to the fatal – SP2 had a tendency to scramble NTFS partitions to the point where they were unreadable. Other random bugs included: anti-virus scanners causing problems when writing to a floppy, RAS thinking every connection was a multi-link one, the inability to connect to Ascend routers and auto-running CD-ROMs would cause a BSOD and so on.

Service Pack 3 (17.5MB)

Microsoft kept its head down for the next six months before releasing Service Pack 3 in May 1997. It had already swollen to 17.5MB in size but that was because of some new features that were introduced with this service pack. To be fair it included fixes for over 180 bugs but its main thrust was increased security – it added five new security features to NT, including a neat password-filtering tool for enhancing overall security:

- Server Message Block (SMB) signing
- Password filtering
- Anonymous user restrictions
- System keys
- CryptoAPI 2.0.

SP3 also introduced NT users to the



Forewarned is forearmed – it pays to get the lowdown on a new Service Pack straight from the horse's mouth – go to the NT Server home page at www.microsoft.com for the word on patches

delights of DirectX 3.0 and ODBC 3.0 (Microsoft Open Database Connectivity) and an upgraded remote procedure called RPC transport protocol.

The SMB protocol defined program-level commands for obtaining or providing remote file services in a network environment. A new version of the SMB authentication protocol, the Common Internet File System (CIFS) file-sharing protocol, comes with SP3. On NT Server SMB signing is disabled by default, but on NT Workstation it's enabled by default. You need to edit the Registry to use SMB for communications with NT Server. You can configure SMB signing in two ways: enabled and required. Enabled means that if a client system has SMB signing enabled, it will be the preferred communications method. Required means that all clients must use SMB signing to communicate with the NT system.

Service Pack 4 (36MB)

Over a year passed before the next Service Pack was released in November 1998. It was long overdue and could have been released much earlier but the story was that it was shelved so that the developers could devote more time to what was then Windows NT5.

SP4 was a biggie as it featured a veritable raft of new features and enhancements as well as the customary bug fixes – this accounts for the doubling in size to 36MB. It was also comparatively bug free so this was arguably the first 'must-have' service pack. New features included a variety of Y2K fixes, support of the euro currency symbol, DCOM/HTTP Tunnelling TCP protocol, TAPI 2.1, Internet Group Management Protocol (IGMP) v2, Microsoft File and Print Service for NetWare Support for Client32, Remote Winsock, Routing Information Protocol (RIP) Listener, Message Queue (MSMQ) for Windows 95 Client, updates for MS Transaction Server, Certificate Server, Index Server and IIS. This mega service pack even included the NT5 file system driver to 'ease migration'.

It also included IE 4.01 SP1, NetShow Services 3.01 and Windows Media Player as well as over 600 bug fixes. Security was further tightened – SP4 contained numerous updates aimed at tightening Internet security. These included stronger NT LAN Manager log-in encryption, better Event Log security, faster, more

secure Virtual Private Networking connections and a fix for a loophole that allowed ordinary users to elevate themselves to administrator status. The update also bundled a new Security Configuration Manager MMC plug-in for assigning and tracking security privileges to NT machines across the network and improved desktop management tools. Yet another goodie was a new, web-based Enterprise

Management interface that allowed administrators to easily use system management tools, such as HP OpenView, Tivoli, or CA UniCenter with NT.

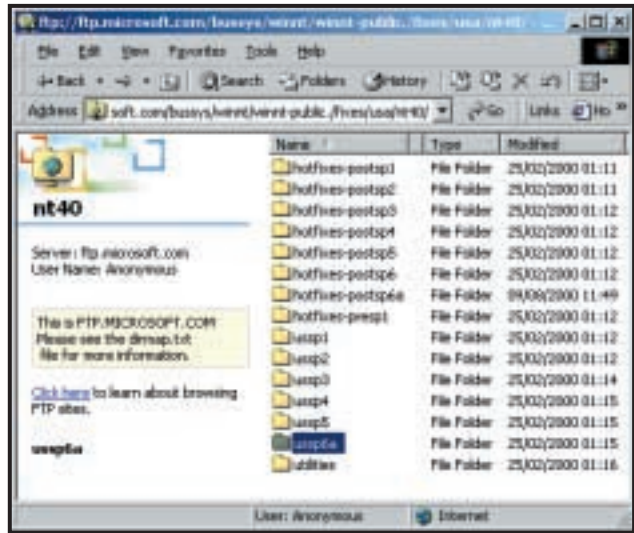
Service Pack 5 (34MB)

Only six months were to elapse before the release of the next service pack in May 1999 – Microsoft had decided to release service packs in a more timely manner. According to Microsoft, SP5 didn't add any new features to the OS, which explains why SP5 emerged so quickly after SP4. So, it was largely a collection of all the bug fixes to date. Microsoft classified these fixes into six categories: base operating system, Y2K issues, networking, shell, security and other. You can find a list of each category's fixes at Microsoft's website at:

www.microsoft.com/ntserver/nts/downloads/recommended/sp5/updates.asp

Bug fixes included yet more Y2K fixes, cluster server updates, fixes for Microsoft Exchange/RAS issues and an Exchange Protocols Failure issue, updated reservation management with DHCP Servers, improved updating of MTS files and an 'integrated' IE 4.01 with SP2.

After the relative success of SP4, SP5 introduced a few bugs of its own, which it fixed with one 'rolled up' hot-fix patch, containing TCPIP-Fix, Clik-Fix, SMS-Fix, MSV1-Fix, Infget-Fix, Nprpc-Fix and Gina-Fix, which fixed bugs in the TCP/IP stack, mislabelling of Iomega Clik! Drives and a memory leak that occurs when the SMS/SNMP agent is under stress.



If you need to get hold of a particular service pack, go to Microsoft's ftp site at

[ftp://ftp.microsoft.com/bussys/winnt/winnt-public/fixes/usa/nt40](http://ftp.microsoft.com/bussys/winnt/winnt-public/fixes/usa/nt40)

Service Pack 6 & 6a (35MB)

Surprisingly, given the debacle that was Service Pack 2, Microsoft went and did it again with its most recent NT service pack release, though to be fair, it wasn't quite so dangerous. And it did the right thing – it released SP6 in October 1999 then withdrew it, releasing SP6a a month later, in November 1999. It included more than 240 bug fixes for Windows NT Base Operating System, Networking, Shell and Security components and even more Y2K fixes.

The CD-ROM version of SP6 contained more updates than the download version, including improvements to Internet Explorer 5.0, the Security Configuration Editor (SCE), Distributed Component Object Model (DCOM), Winsock, Microsoft Message Queue Server (MSMQ) files for Windows 9x, additional print drivers, files to install RRAS in unattended Setup mode, and updates to Certificate Server and Internet Authentication Service (IAS).

So what was the big problem with SP6? Nothing more than a Winsock bug that prevented Lotus Notes and some other Winsock applications from working properly – see Microsoft Support Online article Q245678.

CONTACTS

Roger Gann welcomes your comments on the Windows NT column. Contact him via the PCW editorial office or email nt@pcw.co.uk



Cracking the code

Chris Bidmead gains access to Proxim source code and a potential wireless solution for Thinkpad

Last month I promised I'd tell you about the cunning plan I had for the IBM T20 Thinkpad. It's actually a military secret, but this month I'm just about ready to spill the beans. This is all because I currently have another tasty piece of hardware on loan: Proxim wireless link.

Specifically, I have a Proxim RangeLan2 7420 PC Card, which plugs into a laptop like the T20, and a RangeLan2 Access Unit – a small bridge/router box with an Ethernet connection to my wired LAN. Given the right software drivers installed on the laptop, the 7420 establishes a wireless link with the Access Unit (up to 400ft away in typical office environments). This range means I can happily retire to the far end of the garden with my Thinkpad when the spring weather finally arrives.

The Access Unit is effectively a standalone server, so it doesn't need software drivers. Setting it up was simply a matter of connecting my laptop directly to it through a serial port and using the minicom Terminal Emulation utility to access its setup menu. Once the device has been given a TCP/IP address on the network you can lose the serial cable and do any other configuring by way of the Access Unit's built-in web browsers. So, it's all completely operating system independent.

Not so the PC Card. It needs drivers, and Proxim only officially provides these for Windows and NetWare. And, alas, Proxim hasn't yet seen the light about free software, and keeps the interface specifications for the card top secret. Access to the source code requires a licensing fee outside the budget of most Linux users. This is a real shame as it's a very popular wireless solution and an example of great technology to boot – it uses the same kind of frequency hopping that was developed for interference and snoop-free wireless communications by the military.



From the pdf blurb for the Proxim RangeLan2 Access point, downloadable from www.proxim.com. The Electric Eyes inlay is the RangeLan2 PCMCIA card

Narrowband interference from domestic devices, such as microwave ovens, are a notorious nuisance with radio LANs, and frequency hopping helps circumvent this. The technology also avoids communication problems associated with multipath reception.

However, the military secret has been cracked – sort of. No, this isn't another of those unpleasant litigious situations like the wretched CueCat which we discussed last month. Dave Koberstein, a Red Hat user, has acquired legitimate access to the Proxim source code and, together with an unnamed friend, has been able to come up with something useful, which is up on his website at www.komacke.com/distribution.html.

The unfortunate outcome of the need to sign an official Non-disclosure agreement is that the code that connects directly with the proprietary interface is only available as a pre-compiled linkable library. A note covering this says: 'Copying policy: copy away as long as you don't call Proxim for support. See copyright file for additional restrictions.' There is open source code for the wrapper round the library that creates a loadable module for your particular Linux kernel. This is where the hairy

compilation stuff I warned you about last month comes into the picture. Many of the steps I went through to create the binary loadable module apply to Linux module creation in general, so hopefully my notes might be useful – even if you aren't planning a wireless link.

Dynamically loadable modules effectively become part of the kernel when they're brought into play, so the kernel and the module have an unhealthy close relationship. For this reason you need to compile a module against the specific kernel it's going to run with – and here, 'against' means that the process of compiling the module will need to access information about the kernel held in header files in the

source-code tree.

The first step with any module compilation is to make sure you have the source tree of the kernel you will be running when the module is done. This may be the current kernel you're using. The standard place for the kernel source tree on Red Hat type Linux distribution is under `/usr/src/linux`, which is a link to a directory whose name includes the version number of the kernel. Change into this directory and type:

```
make mrproper
```

If the system responds with a stream of compilation-style messages, you're in business – your source tree is in place. If you get the Unix equivalent of a shrug, you'll probably need to install the source tree. Normally this will be available in package form, called something like `kernel-source-2.2.14-5.0.rpm`. The process of installing the package will position the source tree correctly under `/usr/src` and create the link to `/usr/src/linux`.

What it won't do is create all the necessary header files. If you try to compile modules against a freshly installed tree you're likely to run into 'missing header' messages. What you need to do immediately after installing

the source tree is (from inside the /usr/src/linux directory):

```
make dep
```

This ensures that all the separate code sections that make up the kernel are singing from the same hymn sheet. The good news is that you don't have to go through the whole business of actually building the kernel (unless you particularly want a new one).

Because my Proxim device is a PC Card, I also need to have the PC Card services installed, so my next step was to download the latest PC Card source from <http://pcmcia-cs.sourceforge.net>. Luckily, I don't need to go into details of compilation here because Dave Hinds, the guy who coded the PC card services, is a talented documentor and maintains a very comprehensive and up-to-date How To file. It's provided with the PCMCIA-cs tarball, but you can also read it separately at, for example, www.linuxdoc.org/HOWTO/PCMCIA_HOWTO.html. Dave explains why he doesn't offer the PC Card bundle in binary form: '...distributing binaries would be a significant hassle. It is complicated because some features can only be selected at compile time, and because the modules are somewhat dependent on having the "right" kernel configuration. So, I would probably need to distribute precompiled modules along with matching kernels.'

Read the How To file, but if you're the impatient type, try this first:

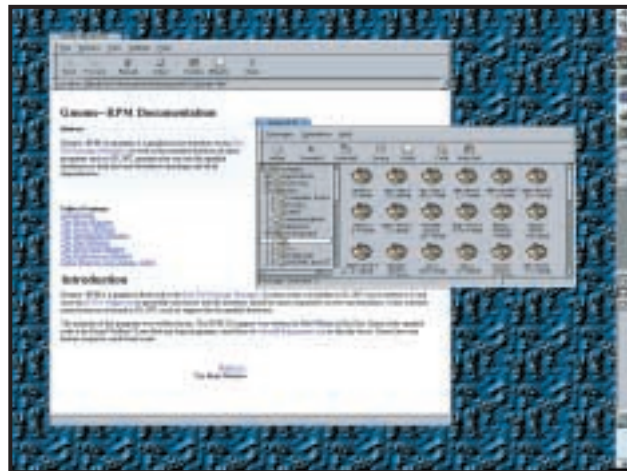
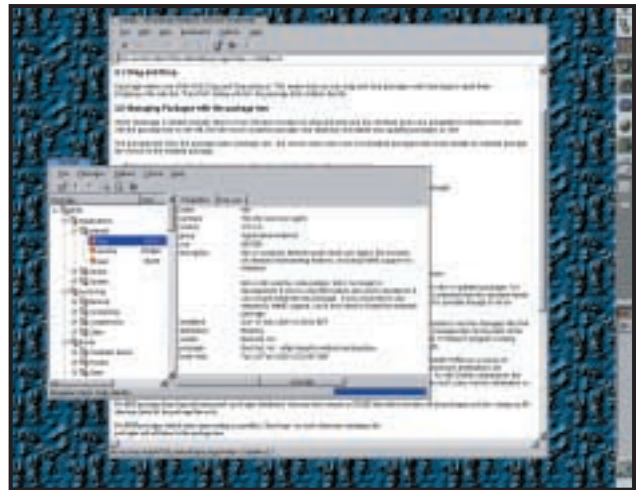
1. Untar the tarball under /usr/src with `tar xvzf pcmcia-cs-<version>.tgz`.
2. Inside the directory this creates, run `makeconfig`. This checks your system to see if the components needed for compilation are all in place, and creates the appropriate configuration for the next stage.
3. Do `make all` and then `make install`.

If this doesn't work out, then it really is time to read the How To. With all that behind me I was now ready to download the code for the Proxim card from Dave Koberstein's site. Next month I'll tell you how I got on with it.

What provides?

If you're running Caldera, Mandrake, Red Hat or several of the other Linux distributions that use the RPM packaging system you may have been frustrated by the choosiness of the rpm installer. From time to time you may see a message something like this:

This is Toivo Pedaste's KPackage, a graphical front end not just to the Red Hat Package manager, but also to Debian, Slackware and other packages. You may find this an easier way of installing the files you need for the Gnome Desktop. Personally, I prefer the command line



James Henstridge's GnoRPM the Gnome alternative to KPackage, although it's limited to RPM packages only. If you use either this or KPackage, I do recommend that you read the RPM main pages, so you understand what's going on underneath

```
[root@t20 bidmead]# rpm -i  
dosemu-1.0.0-5mdk.i586.rpm  
error: failed dependencies:  
    dosimage is needed by  
dosemu-1.0.0-5mdk
```

Okay, so now you need to look for another rpm called something like `dosimage-<version>.rpm`. No, `dosimage` isn't another package, it's a resource inside a package, and the package could be called absolutely anything.

Note that what we're looking for here isn't any particular file – it's something called a 'virtual capability', in other words a named resource of some kind, the nomenclature being an arbitrary invention of whoever put the packages together.

You can quiz your installed packages using the `-whatprovides` command line switch like this:

```
rpm -q --provides dosimage.
```

But what if you don't find what you're looking for?

I discovered only recently that the

RPM database at <http://rpmfind.net> not only allows you to search for rpm packages by name, but can also be searched for resources.

A search on `dosimage` revealed the resource to be in a package called `dosemu-freedos`. Downloading and installing the package cured the dependency problem.

The easy way to Gnome

You'll have gathered from the Proxim progress I'm reporting this month that I now have a stable Linux installed on my IBM laptop – alas it's not, as I had hoped, SuSE 7.0. Last month I suggested a way of expanding the physical space that the SuSE LiveEval makes available, and this month I was hoping to take this further.

I thought it would be nice to be able to take a non-threatening distro like the SuSE LiveEval, which anybody could install without fear of disturbing their existing operating system, and then show ways of growing this CD-dependent



demo into a fully fledged hard disk installation.

I would still like to believe that this can be done, and I welcome any suggestions from you regarding how to go about it. I have tried several approaches, but started to run into a number of serious complications that made the idea seem like more trouble than it's worth.

So instead, the T20 laptop is now running Red Hat 6.2 – or rather an installation that began as Red Hat but now has a home tailored 2.2.17 kernel, a bunch of upgrades, mostly from Mandrake, and the latest stable Gnome desktop (version 1.2.1 at the time of writing). I thought I was performing the Gnome upgrade the easy way, using RPM binaries rather than compiling from scratch. But I found myself running into dependency problems of the kind I describe in the section about 'What provides'. The core Gnome RPM wouldn't install until I upgraded half a dozen libraries, and each of these libraries demanded, in turn, further upgrades, or complained about other kinds of missing resources. Following this rapidly branching tree of dependencies requires patience, which I lack (<http://rpmfind.net> responds: 'No package found of name patience') or at least considerable obstinacy, which I seem to have aplenty.

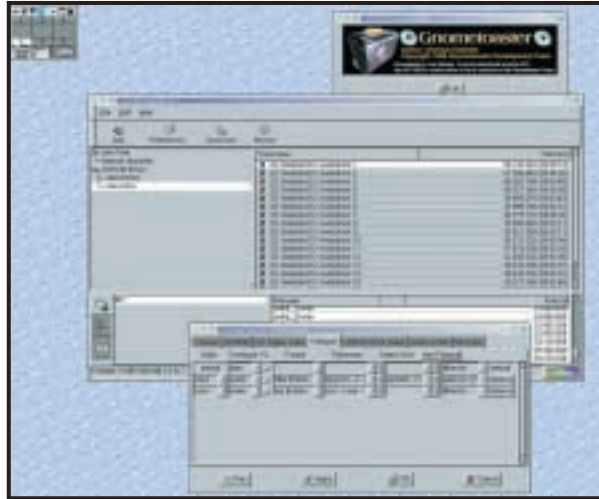
Having finally got it all together and working, thanks to multiple downloads from <http://rpmfind.net>, I discovered that there's a much easier route to the Gnome desktop, not just for several different flavours of Linux, but also for Solaris for Sparc. Just follow the instructions at:

www.helixcode.com/desktop. The process is automated – for example, Red Hat users just need to become root and then, in the bash shell, type:

```
Lynx -source http://go-  
gnome.com/ | sh.
```

(Key: *code string continues*)

This evokes the text-based Lynx browser, which in turn pulls down a



Sony has sent me a CRX-145 CD-RW, an ATAPI CD rewriter that Linux can use as a pseudo-SCSI device, thanks to the IDE-SCSI module. I'm hoping to include some CD-burning adventures in future columns; meanwhile here's a screenshot of GnomeToaster, a graphical drag 'n' drop front end to command line goodies like mkisofs, cdrecord, and cdda2wav



DrakFont is one of several user-friendly refinements Mandrake has developed specially for its own distribution. It's designed to automate the somewhat tricky business of installing TrueType fonts, either directly from your legacy Windows partition or from the Linux filesystem or a CD-ROM

script designed to walk you painlessly through the download and installation.

The script includes unencoded binaries for two flavours (Intel and PPC) of Zachary Beane's SNARF utility. SNARF (Small Noninteractive All-purpose Resource Fetcher) is a tiny miracle, which does resumable ftp and http file fetching and a lot more besides. You can learn more about it at www.xach.com/snarf.

Power piping revisited

Some of you may remember the 'Power of the pipe' challenge we ran last year. The column was inundated (many thanks to you all) with your suggestions for the best script or single pipeline that

would return the name of the newest file in a directory. Just the name, and regular files only. It wasn't a mere academic exercise; it had come up in a real-life text retrieval application, although admittedly it's not something you would need all the time.

However, from your responses I have ended up with one simple script that does a rather different job, but one that turns out to be generally useful several times a day. I regularly switch between the X display and one of the plain text virtual terminals that you can access in Linux by hitting Ctl-Alt-Fn, where n is a number, usually between one and six (with seven being used to return to the X display). Working at a plain text terminal, or inside an Xterm, I often need to be reminded of the names, or other details, of the files I'm currently working on, or have just downloaded. `ls -lt` will do the job, but if you have a lot of files you'll need to scroll back (typically Shift-PgUp under Linux) to read the top few lines.

Or of course you could run a simple pipe like this:

```
ls -lt | head
```

To display just the top 10 directory entries, which may be files, other directories or, of course, named pipes or sockets. But I find I usually only want to see files.

So here's the refinement:

```
#!/bin/bash
```

```
# show newest $1 ✓  
regular files in dir $2  
ls -ltr $2 | grep ^- | tail ✓  
$1 | tac
```

Nothing magnificently original or insightful here, and because it's only used in-house I haven't bothered to check parameters or add usage notes. But as it's turned out to be so useful I wanted to share it with you.

CONTACTS

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Off-the-MPEG video

Gordon Laing looks at the latest craze to sweep the Internet – copying from DVD to CD-ROM

For the first *Hands On Hardware* of the true new Millennium (as far as the January 2001 cover of the magazine is concerned anyway), I've been playing with the latest phenomenon to hit the Internet and strike fear into the hearts of media executives. I've also got some vital information for anyone wanting to upgrade their hard disk, but who is worried about the different types of EIDE interface out there.

Pirate videos?

The latest craze to hit the Internet involves copying high-quality media onto your PC, compressing it into a more compact format, then revelling in its portability and ease of electronic distribution. Sound familiar? Well, I'm not talking about music and MP3s. This craze involves nothing less than copying DVD video onto your PC, and then re-encoding it into a format that could squeeze onto a bog-standard CD.

This means you could transfer DVD material onto a CD-ROM, which could be played on a system without a DVD-ROM drive, or keep a few hours worth on a relatively modest hard disk for future reference.

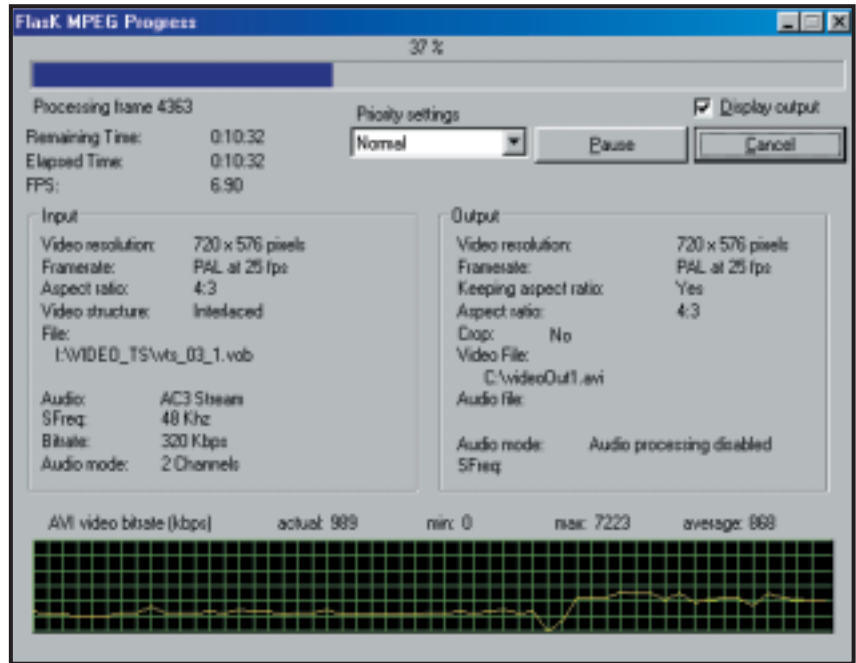
Sound tempting? Well, here at *PCW* we, of course, do not support any type of piracy and would remind any interested parties of the strict letter of the law: you are not allowed to make copies of copy-

The latest phenomenon to hit the Internet and put fear into the hearts of media executives

righted material and/or redistribute it. What follows, therefore, is a demonstration, using a copyright-free promotional DVD video, to show the power of current compression technology, not to mention a handy system benchmark.

MPEG 1, 2 and 4

The Motion Pictures Expert Group, or



The FlasKMPEG utility in action, converting the MPEG-2 video stream from a copyright-free DVD into highly compressed MPEG-4. Note the original PAL video at 720 x 576 pixels and 25 fps. Also note the graph at the bottom, indicating the bit rates used for the final encoded video. We chose an average bit rate of 900Kbit/sec, compared to DVD video working at around 6000Kbit/sec

MPEG for short, has long been developing cunning means to compress digital audio and video into forms that are more easily distributed by the medium of the day. The original MPEG-1 format could squeeze up to 74 minutes of reasonable VHS quality video onto a normal CD. Several years ago, MPEG-1

the compressor behind DVD video titles, albeit currently at standard PAL or NTSC TV resolutions. As anyone with a DVD player will know, MPEG-2 certainly looks pretty good, while the high capacity of DVD discs allows a whole movie with extras to be stored.

The boffins at MPEG, however, were already working on a new format that was initially designed for streaming relatively high-quality video over modest bandwidths. The MPEG-4 standard allows just this, delivering better quality video than MPEG-1 at the same or even lower bit-rates. Like other MPEG systems, MPEG-4 can operate at variable bit-rates to suit the medium of delivery, and while originally designed with streaming from the Internet and even future mobile phone networks in mind, it can quite happily be used on conventional hard disks and CD-ROMs.

Flask of hot MPEG?

The theory goes like this: if you want to fit

was employed as the technology behind VideoCD, which, while failing to make an impact in Europe and the US, still enjoys considerable success in Asia.

MPEG-2 was developed with higher resolutions and bit rates in mind, to satisfy broadcasters wanting a format that could support anything from standard TV to high-definition systems. The DVD Forum also chose MPEG-2 as

a movie onto a CD-ROM, then you simply divide its capacity by approximately 120 minutes, and come up with a maximum average bit-rate. Since CD-ROMs can store around 650MB of data, then you're looking at a bit rate of about 740Kbits/sec for 120 minutes worth of material. Since MPEG-1 on VideoCDs required around 1,380Kbits/sec and MPEG-2 on DVD regularly idles at around 6,000Kbits/sec, can MPEG-4 really deliver the goods with a mere 740Kbits/sec to play with?

To find out, I downloaded the free FlaskMPEG encoder from <http://go.to/flaskmpeg>. This modest 850KB download installs a utility that can take the MPEG-2 video from a DVD movie and encode it into MPEG-4 video; it'll also decode the PCM or AC3 audio streams into a more convenient format if desired.

As you'd expect from an encoder, there's a wealth of options: resize the video, choose an average bit rate and even crop out letterboxed bars to save further data.

FlaskMPEG lets you do all of this, but does demand a third-party MPEG-4 compressor/decompressor (codec). Fortunately there's also a free MPEG-4 codec readily available on the Internet. Called 'Divx ;-)', but not directly related to the failed DVD-rental proposition,



The FlaskMPEG encoder can take an MPEG-2 video from a DVD and encode it into MPEG-4 video

it's a 700KB download available from <http://divx.ctw.cc>. This file will add MPEG-4 decoding capability to the standard Microsoft Media Player, and allow programs such as FlaskMPEG to use MPEG-4 as a compressor.

And that's about all there is to it. Simply install the MPEG-4 codec, fire up FlaskMPEG, choose your options, then insert your DVD disc and begin encoding. Oh yes, just one small thing – it'll take absolutely ages.

Encoding MPEG-4 is an incredibly processor-intensive task, especially if

you're converting from a previously encoded digital format such as MPEG-2 in the first place. Using my 866MHz Pentium III system with 512MB of RAM, FlaskMPEG was encoding about four times slower than real time. Hence a seven-minute clip took 28 minutes, while a whole two-hour video would take about eight hours to convert and re-encode. Sadly FlaskMPEG isn't yet enabled for the SSE instruction set of modern Intel CPUs, which would almost certainly speed up the process.

Decoding MPEG-4 is also much more

Hard drive interfaces explained

Today, much confusion lies with the different EIDE interfaces that allow hard disks (along with other drives) to communicate with the PC's chipset. Indeed most chipsets these days feature built-in EIDE controllers, allowing motherboard manufacturers to simply attach a suitable physical connector for immediate and cheap drive support.

As time goes on, the EIDE specification improves, essentially in terms of maximum data throughput, or bandwidth. In recent years we've seen the bandwidth increase from 33 to 66 and now to 100Mbytes/sec with the so-called UltraDMA33,

UltraDMA66 and UltraDMA100 interfaces respectively (also known as ATA33 and so on). Study the specifications for hard disks and motherboards/chipsets, and you'll also see these terms used to describe their capabilities, but which are compatible with which?

In order to enjoy the maximum bandwidth, you should match the interface of your hard disk with that of the motherboard – so this means connecting an UltraDMA100 hard disk to an UltraDMA100 interface on your motherboard. As only the very latest motherboards feature UltraDMA100 interfaces though, what

happens if you have an older UltraDMA66 or 33 controller?

The answer is very simple: your EIDE system just runs at the lowest common denominator. You can go ahead and connect an UltraDMA100 hard disk to an UltraDMA66 or 33 controller, but you'll limit the bus bandwidth to 66 or 33Mbytes/sec respectively. Similarly, if you connect an UltraDMA33 or 66 drive to a faster interface, it'll still be limited to operating with a 33 or 66Mbytes/sec bandwidth respectively.

To further reassure you, remember that even the fastest hard disk in the world

is hard pushed to deliver more than 40Mbytes/sec, and even then only when reading data in nice easy blocks located next to each other.

In most situations, the hard disk will be accessing data from all over the drive, dramatically reducing data throughput sometimes to just a few Mbytes/sec.

Consequently, unless you have an EIDE RAID array, where two or four identical hard disks are simultaneously operating at their highest sustained data transfer rate, then the bandwidths offered by UltraDMA66 and 100 interfaces are little more than an exercise in marketing numbers.



Name that CPU

Mark Mitchell recently posed the following problem: 'I've been told that it is possible to identify the Thunderbird Athlon by its 462-pin Socket A form factor. My PC supplier insists that I have been supplied with a 700MHz Thunderbird yet it resembles the older, larger Athlon Slot A module. AMD says that there was a limited production run of Slot A Thunderbirds intended for OEM use only.'

Well, like Coppermine Pentium IIIs, the Thunderbird Athlons feature much faster on-die Level 2 cache, and are hence more desirable than the older versions with off-die Level 2 cache. The good news is that absolutely every single Socket A Athlon is a Thunderbird design with on-die Level 2 cache. The slightly confusing news is that before Socket A

motherboards became available, AMD produced a handful of Thunderbird Athlons in the older Slot A form factor, for testing.

We asked AMD if a 700MHz Slot A Thunderbird Athlon could have made it into a production system, and how to identify one from the old version. AMD explained that the Slot A Thunderbird was for OEM and test use only, and not meant for distribution, although some may have been subsequently sold in systems. A 700MHz model was produced, labelled as AMD-A0700MPR24B A, where AMD-A indicates a Thunderbird core. The older Slot A Athlons start with AMD-K7.

If you don't want to open your PC up, consider downloading H Oda's legendary WCPUID utility, which supplies a huge range



H Oda's legendary WCPUID utility is an invaluable tool for identifying types of CPUs – in the screenshot, note the 1,000MHz Athlon has a Thunderbird core

of information about your CPU, including whether it's a Thunderbird Athlon or not.

You can download WCPUID utility from: www.h-oda.com

processor intensive than decoding MPEG-1 or MPEG-2. Using a software DVD player to decode MPEG-2 on the system described above, occupied about 40 per cent of my CPU resources, compared to around 60 per cent for MPEG-4. Scaling the original video window to my standard desktop of

Could this be possible, at around one-tenth of the size? Well, despite clever compression techniques, the simple answer is a big NO.

Although MPEG-2 and MPEG-4 stills may look pretty similar, once they're moving the differences are much more apparent. Compression artefacts are

decoder, which eliminates the possibility (for now) of sticking a CD-ROM made with FlaskMPEG into a domestic DVD or VideoCD player. However, if you have a sufficiently quick PC, then all you'll need is to equip your media player with a suitable MPEG-4 codec, such as Divx ;-), and you can happily watch this newly encoded material. It's worth noting that Windows 98 SE was more stable than Windows 2000 when performing the encoding process.

Whatever the websites say, it's far from indistinguishable from the original MPEG-2 DVD video, but as a means to carry several hours of material on a hard disk, or for delivering lots of high-quality video on a normal CD-ROM, MPEG-4 is an invaluable codec.

A two-hour video would take about eight hours to convert and re-encode

1,204 x 768 increased the MPEG-4 hit to around 80 per cent. Remember, this is using a Pentium III running at 866MHz, so users of slower systems may suffer from lost frames.

How does it look?

My initial enthusiasm for trying out MPEG-4 stemmed from reading many reports of the video being virtually indistinguishable from DVD video, even at bit-rates of around 900Kbits/sec.

clear, with moving edges being reduced to small blocks, particularly when the scene changes.

That's the downside. The upside is that it still looks better than MPEG-1 at lower bit rates and, to be honest, if you stand back a little, MPEG-4 at around 900Kbits/sec is pretty watchable – and remember that I'm an intolerable snob when it comes to video and audio quality!

So there you have it. Videos encoded with MPEG-4 require an MPEG-4

CONTACTS

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In search of concordance

Tim Nott goes hunting for automatic document indexing and finds that it was easier in 1992

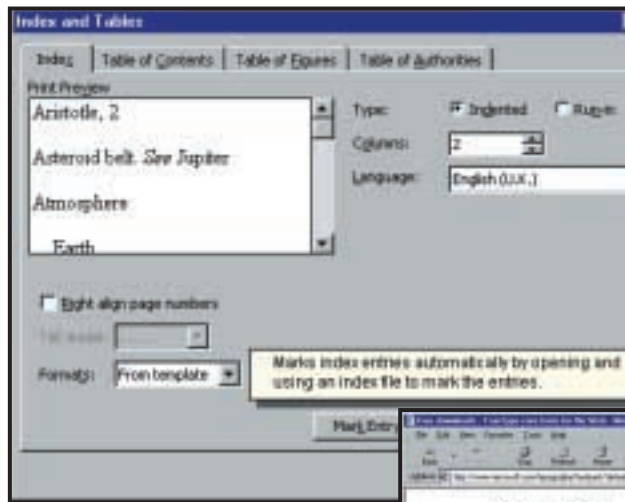
In September's column, we discussed indexing a document automatically using a concordance (or AutoMark) file.

To recap briefly, this is a two-column table with the left column containing the words to be indexed as they appear in the text; and the right column containing the index entries themselves. This way you can edit the latter to be all uppercase, for example, or collect variants of a word under the same index entry. Surely, one would think, it wouldn't be beyond the capabilities of a PC to compile the concordance itself: in other words make an alphabetical list of words found in the document, excluding 'stop' words such as 'a, an, and, another, any' and so on. Tony Everard and Storm Dunlop both had vague memories of a DOS word processor that would do just this, but unfortunately their memories were a little hazy. So, hazarding a guess, I blew the dust off an old Wordstar 7 DOS manual (circa 1992), and read the following. '...you can tell Wordstar to index every word (in the document) except those listed in an exclusion list'. It comes with a built-in exclusion list, or you can create your own, document-specific, one. Curiously, this feature seems to have disappeared in the Windows version of Wordstar, and has never been part of Word for Windows. There's progress for you.

So, off I went on a web search. After an hour all I could find was the sort of thing used by academics to count the number of times Shakespeare uses the word 'poltroon' in his works. Apparently you can get a PhD for this sort of thing, but it doesn't help us much. The one I downloaded was far too complicated and had suicidal tendencies under Windows 98 SE. So, next I turned to some Word discussion groups, with more encouraging results. At the moment it's a race between two macros, but at the time of going to press these were both still 'under construction'. So watch this space.

Mystery corner

It may be somewhat off-topic, but as



Left: AutoMark creates an index automatically

Below: Andale tracked down from the MS typography web page

several readers have mailed me with the same query, and as it is Office, if not Word related, I thought I'd mention it as a matter of public interest. It concerns the mysterious case of Access 97.

David Corston's case was typical: he had a legitimate copy of MS Office 97, but when he went to start Access, got the message that 'Microsoft Access can't start because there is no license for it on this machine.' David was about to back up, reformat, and reinstall, but fortunately, there's an easier way. This behaviour can occur, according to Microsoft, if 'Access is not properly registered on your computer'. The cure – and I am not kidding – is to rename the Hattenschweiller font file from hatten.ttf to hatten.xxx. You will then be able to reinstall Access using Office Set-up Maintenance Mode, from Control Panel, Add/Remove. Having done this, you can rename the font file back to hatten.ttf. Read the full story at: <http://support.microsoft.com/support/kb/articles/Q141/3/73.asp?LN=ENUS&SD=gn&FR=0>.

And here, at last, is an answer to the mystery 'Script error in vtw98.lwp' message that appears when starting WordPro. Alan Hitchin had this problem, but then got rid of it by reinstalling WordPro. A few weeks later, back it came. Alan eventually tracked it down to a problem with ViaVoice, and solved it by



removing vtw98.lwp from Edit, Scripts and Macros, Set Start-up Scripts.

Apologies to Dick Drinkrow and any others who went looking for the Andale Mono font (November's column) and found the URL I gave didn't work. I'm sure it did at the time, but if you go to www.microsoft.com/typography, you should be able to navigate to the free fonts from there. And finally, thank you John Gray, for a comprehensive source of monospaced font information at <http://bsuvc.bsu.edu/prn/monofont/index.html>.

CONTACTS

Tim Nott welcomes your comments on the Word Processing column. Contact him via the PCW editorial office or email: wp@pcw.co.uk. Please do not send unsolicited file attachments.

A time to work

Stephen Wells solves a timesheet headache, plots a logarithmic graph and sorts out surnames

Dagmar Kattler emails: 'I have recently developed a staff time sheet with Excel 97. Users input their daily starting times in column C and their knocking off times in column D. One is subtracted from the other in column E. At the bottom of column E is a total of their hours worked in the week. But if users write TOIL (time off in lieu) into a cell in column B they manually have to change the total in column E into 0:00, or if they are on holiday, they have to change that cell to show the figure for their daily contractual working hours.

'Can I write a function, formula or macro, that says the following: If B6=Worked, then E6=(D6 - C6); however, if TOIL is written in B6, then E6=0:00; but if BH (Bank holiday) or Sick or H (Holiday) is written in B6, then E6 will return the value in B16 (in which staff will have written their daily contractual hours); and if HAW (holiday all week) is written in B6, then E6= B16*5?'

I suggested using a pick list, (see screenshot 1). For this example I've entered the unabbreviated options in the range J5 to J9: Time off in lieu; Bank holiday; Sick; Week's holiday and Worked. Cells K5 to K9 are left blank as they will be used for cell links. And the cells immediately around the block J5:K9 are blank.

To create this example, enter 8:00 in cell B16. Display the forms toolbar and create a combo box. You can draw this wherever you like but I drew it over cell B6. Right-click on your combo box and under Format Control the Input Range is J5:J9. The cell link here is K5. In the drop-down lines box enter 5. You must give the range E6:E12 the Custom format

[h]:mm or otherwise you won't be able to display amounts such as 40 hours. The squared brackets show elapsed time - meaning the total hours and minutes of a particular period as opposed to a specific time.

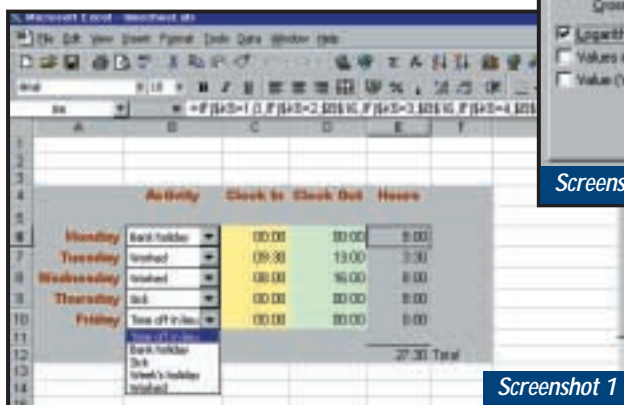
C6 and D6 are used for entry of hours as per your question. In E6 use the formula:

```
=IF($K5=1,0,IF($K5=2,$B$16,IF($K5=3,$B$16,IF($K5=4,$B$16*5,D6-C6))))
```

(Key: ✓ code string continues)

Now the user picks an option from the combo box. If everything is working

Right: Creating an X-Y Scatter chart in Excel offers a logarithmic scale option for the x-axis



Screenshot 1
In column B of a timesheet, staff can pick their daily activity from a drop-down list

properly and you select 'Time off in lieu' you'll get 00:00; 'Bank holiday' or 'Sick' you get 8:00; 'Week's holiday', 40.00; and 'Worked' the total time of the period entered.

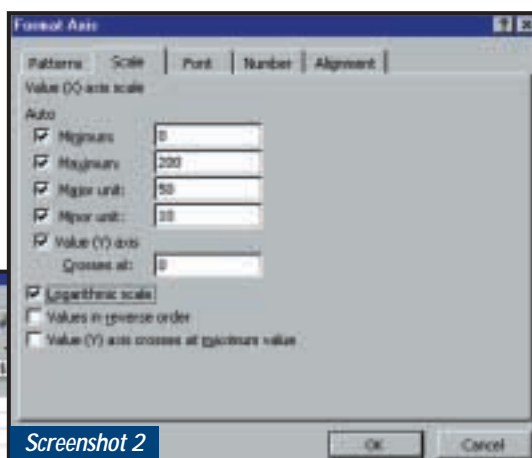
Log x-axis charts

Tim Lewcock asks: 'Is it possible to produce a graph of data in Excel with a linear y-axis and a logarithmic x-axis?' I assured him that it was, then he was kind enough to respond further with a more comprehensive finding: 'After posting on a Microsoft newsgroup I heard back

from Bernard Liengme. Just select the X-Y Scatter chart type. The logarithmic scale option for the x-axis becomes available (see screenshot 2) and you don't have to display a conventional scatter chart, but can have the display as a line chart version if you want.'

Sorting by surname

'I have a list of names in column A on an Excel worksheet' writes Brem Aygerman. 'How can I sort them alphabetically using the surname only?'



Screenshot 2

Highlight the complete list. Choose Data, Text to Columns. In step 1 of the displayed Wizard choose Delimited. In step 2, choose Comma and Space as the delimiters and check the 'Treat consecutive delimiters as one' box. For 'Text Qualifier:' choose, None. Under 'Destination' pick a cell in the next column so your original list in column A is preserved.

The names will then be divided with first names in column B and surnames in column C. Now, click anywhere in the list and choose Data, Sort, Column C, Ascending and the job's done.

CONTACTS

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Stars and snowflakes

Storing data in a de-normalised form can speed up query answering, says Mark Whitehorn

What better topic for the winter solstice and the festive season than stars and snowflakes? Star schemas and snowflaking are terms from the data warehouse world that may have slid across your consciousness and caused you to pause: 'Twinkle, twinkle, little star... schema, how I wonder what you are... Edwena'. Forgive me, it was the best I could do – I'm a database person, not a poet.

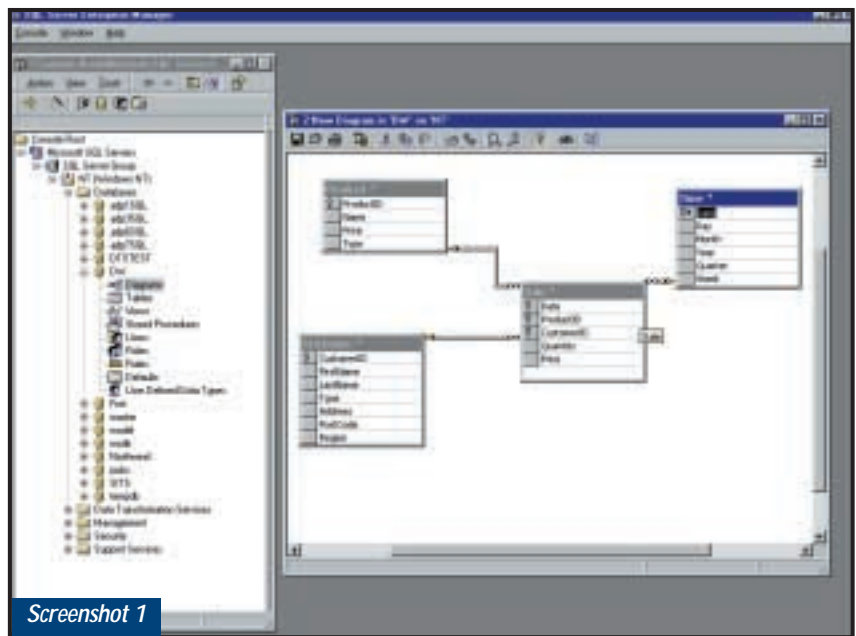
There is a lot of interest in data warehousing at present, stirred up not least by the release of SQL Server 2000 with its bundling of fantastically cost-effective business intelligence tools that allow data warehouse development and more. IBM is following suit, bundling in some of its BI tools with DB2. Oracle appears less keen to follow, which makes the immediate benefits of choosing that product, particularly for a small-to-medium-sized enterprise, harder to spot.

A data warehouse, in its simplest form, holds a copy of data from one or more OLTP (On-Line Transaction Processing) databases. OLTP databases are also called Operational databases for the simple reason that the data therein is being used operationally – in other words it is subject to constant additions, edits and deletions.

By contrast, the data in a warehouse is static, a snapshot of the most recent dump of data from the operational databases. There are three major advantages in creating a warehouse.

One is that, because the data in the data warehouse can come from several different databases, it becomes possible to ask questions that span those different operational databases – in other words you can ask so-called decision support questions.

Secondly, decision support questions like, for example, 'How has the average value of a typical customer order changed over the past five years?' tend to hit every record in the database that is queried. Such questions can have a devastating effect on the performance of



Screenshot 1
A simple star schema with the fact table (Sale) in the middle and the dimension tables radiating away from it. This has been built in SQL Server but there is no reason you couldn't create the same sort of structure in Access in order to see how it behaves. However, Access might not be the best vehicle for a production data warehouse

a transactional system, so running them against a data warehouse can stop the transactional system grinding to a halt.

Finally, since the data in the warehouse is only ever queried, not updated (except when refreshed from the OLTP systems), we can optimise the structure of the data it contains for querying rather than data entry.

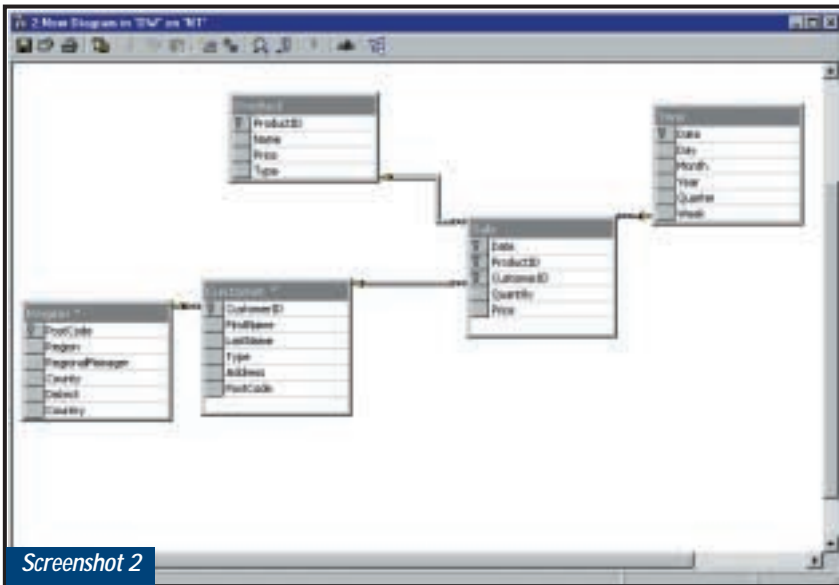
Data in an OLTP database is typically held in an extensively normalised structure, a topic covered before in this column. However, as a quick recap – in a normalised database there are likely to be multiple tables, each one holding all the information about one class of object or entity. So, all of the information about customers is in one table, all the information about employees is in

another and so on. In a data warehouse the majority of the data often resides in a single vast table called a fact table. This fact table forms the centre of the star schema, screenshot 1.

The star schema typically has far more rows (though possibly fewer columns) than any of the other tables in the warehouse. Radiating out from the fact table is a set of dimension tables (see screenshot 1).

A star schema can, at first sight, look as if it is a normalised structure but, as even the few sample rows from the dimension table shows, it is, in practice, highly de-normalised. The fact table records a fact in each row: for instance, that four GT6 spark plugs were sold to Charles Lodge for £2.85 each on 24

| Figure 1: Time dimension | | | | | |
|--------------------------|-----|-----------|------|---------|------|
| Date | Day | Month | Year | Quarter | Week |
| 24/02/2000 | 24 | February | 2000 | 1 | 8 |
| 25/02/2000 | 25 | February | 2000 | 1 | 8 |
| 15/06/2000 | 15 | June | 2000 | 2 | 24 |
| 25/09/2000 | 25 | September | 2000 | 3 | 39 |



Screenshot 2

The star becomes a snowflake as we add tables to the points of the star. This starts to compromise the 'ideal' of the star arrangement and may reduce performance under certain circumstances, but can also reduce storage requirements. Like a great deal of database work, this is often a matter of fine judgement

February 2000. You can think of the dimension tables as containing information that expands the usefulness of the data in the fact table. In the Time Dimension table, for example, apparently repetitive and redundant data is stored (see figure 1).

Now you and I know, almost without thinking, that 24/02/2000 is in February and in the first quarter. With a bit of thought we can even work out that it is in week eight. So why bother storing all this apparently extraneous bumph only to store it all again about 25 February?

It's all about the efficiency with which queries will run. By explicitly storing the information that 24/02/2000 refers to a date in February, we make it very easy for

the database to find all the records that refer to February. In turn, this means that the data warehouse can very easily answer questions like 'Show me the volume of shoe sales, month by month, for the past five years'.

Given a warehouse structured like the one in screenshot 1, what happens if you want to find out, say, the total amount that your customers from the south west spent on your electrical products in the last quarter of last year? The query starts work on the smaller dimension tables first: locating all the fourth-quarter sales from 1999 in the Time table, the customers located in the south west in the customer table and electrical items from the Product table. Armed with this

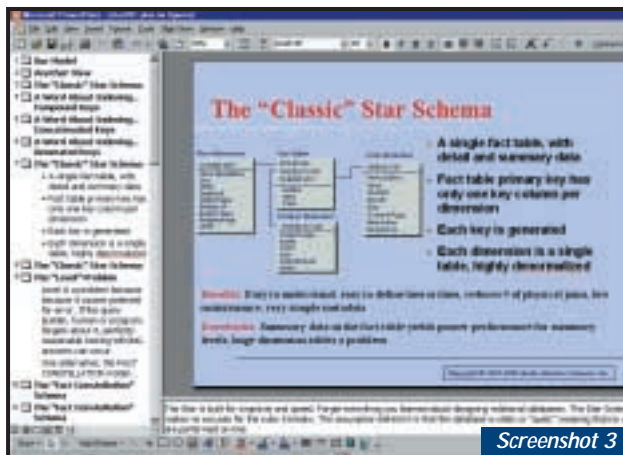
data, it then shifts attention to the large fact table to pull out just the records required. The beauty of the dimension tables is that the query hasn't had to do any complex processing on dates, for example, in order to find the information, it has simply had to scan the relevant column in the table for '4'. And since the tables are read-only, we can index them heavily which means that the query runs faster again.

The other major advantage of a star schema, when compared to a normalised structure, is that it has significantly fewer joins between tables. One of the major speed hits on a query is making these joins, so star schemas are inherently faster to query.

OK, that's the star schema, but what about snowflaking? This cool term means taking a star schema and tweaking it. In the tweaked snowflake version, a dimension table can have a further dimension table attached to it. You might decide that certain details from a customer dimension table, such as region, regional manager and so on, are better stored in a region dimension table hung off the customer table (screenshot 2). If you think an element of normalisation is creeping back in here, you'd be right. A snowflake schema is a compromise, a halfway house between a star schema and a fully normalised database structure.

Star schemas can become more complex than this simple example because people often want to store aggregate values as well as the raw data. An aggregate is typically the sum of a set of raw values. Often the answers to frequently run queries are stored as aggregates: total sales per month or year are popular candidates for aggregation. There is, however, an increase in the popularity of OLAP (On-Line Analytical Processing) tools which offer a far easier and more intuitive way of inspecting and using aggregate values. It seems likely that in the future we'll see a move back towards simpler data warehouse structures and aggregate values being handled more elegantly in an OLAP cube.

Big businesses make good use of star schemas. This useful Powerpoint presentation can be downloaded from www.archer-decision.com/know/pre.htm



Screenshot 3

CONTACTS

Mark Whitehorn welcomes your feedback on the Databases column. Contact him via the PCW editorial office, or email: database@pcw.co.uk



What's the frequency?

Ian Waugh tunes his Media Player into the ever-expanding number of radio stations on the net

The guy whose job it is to come up with all these interesting uses for the Internet must have been having a particularly slow day when he thought: 'Hey, instead of using a radio to listen to radio stations, we could listen to them over the Internet'. Is that dumb or what!

Well, if you look past the initial nerd quotient, it's not as dumb as it sounds. But before we get to the benefits, we should look at what Internet radio is and how it works.

Internet radio, also known as webcasting, uses streaming technology, which delivers content – sound in this case – to your computer. However, instead of having to wait until the entire file has been received before playing it – as is the case when you download a wave file – playback starts as soon as a little bit of the file has been received. If you frequent the many music community sites such as peoplesound.com, BeSonic and Vitaminic, you'll be familiar with streaming because they use it to provide a quick flavour of a piece of music before you waste 20 minutes downloading it.

The most popular streaming player is RealPlayer. Virtually every music site has a link to it and you can download it directly from www.real.com. You can also use Windows Media Player, which is included with Windows Millennium Edition, but can also be downloaded free of charge from www.microsoft.com.

Windows Media Player has a built-in radio tuner for quick access to your favourite stations



RealPlayer has lots of support for finding and organising radio stations

Some sites stream MP3 files and with these you can also use an MP3 player such as WinAmp which is available from www.winamp.com.

Some Internet radio stations broadcast in real time and, therefore, work much like traditional stations. However, they do have one advantage – you can listen to them anywhere in the world where you have access to an Internet connection.

However, the majority of stations broadcast archived material, pre-recorded programs that you can listen to any time, on demand. This allows program planners to put together a vast range of highly eclectic material. For example, you don't have to tune into a general music station and wade through

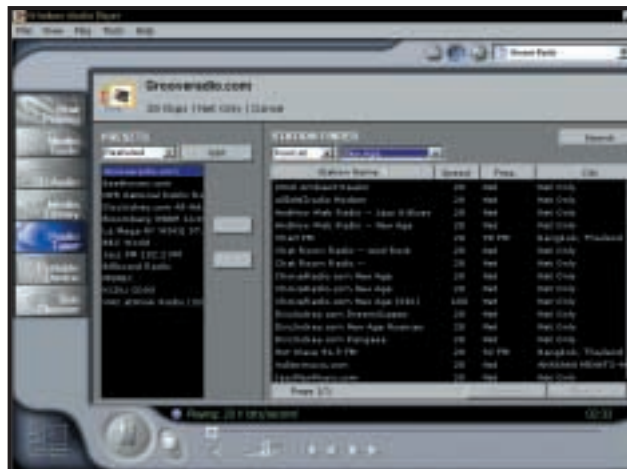
dozens of songs by artists you don't like in order to hear one that you do – there are stations devoted to highly specific dance music genres, country and western (anyone know a C&W fan who can work a computer?), individual classical composers and, for those who are gluttons for punishment and into ego-mutilation, 'breakup' songs.

Stations aren't limited to music. There are talk shows, spoken word channels, religion, sport, news, finance, history – you name it, there's probably an Internet radio channel covering it.

Both RealPlayer and Windows Media Player have a tuning facility. You simply select a station from the list and off you go. You can edit the list, adding ones you come across on your travels through radiophonic cyberspace (see box).

One of the neat things about Internet radio is that the vast majority of stations provide details of songs as they are playing, unlike many terrestrial clever-clog DJs who think it's great to play 17 songs back to back without telling you what any of them are.

Some stations allow you to skip songs which, obviously, they can only do if the material is archived, although this may not be strictly legal. There is a set of conditions that would-be webcasters must adhere to in order to get a licence in the US. It has been produced by the RIAA (Recording Industry Association of America), the association that tried to



prevent the Diamond Rio going on sale and which sued MP3.com and Napster. You can read all the conditions at www.riaa.com but it's essentially designed to prevent listeners selecting specific songs from an archived set and to limit the number of songs from any one album that can be played in a specific time period.

The reasoning is similar to that prevailing at the time commercial radio was launched – the belief that if people can tune in to music at any time, they'll

stop buying records, or 78s as they were then. In practice, radio actually stimulated record sales.

The main problem with Internet radio is that it is low quality. In order to work, streaming technology must deliver content at a speed faster than it is being played. For users with a 56K modem, the fastest speed is around 32Kbits/sec which is listenable but not very high quality. To equate this with MP3 quality, standard MP3 files are recorded at 128Kbits/sec which is commonly

assumed to be of 'CD quality' (although many people would disagree). This assumes a good connection and many sites broadcast at 16-24Kbits/sec to cater for users with slower modems. If you have a cable, ISDN or ADSL connection, you can receive higher quality streamed broadcasts and some sites do cater for such users.

The RIAA webcasting restrictions also specify that broadcasters should prevent streamed media being downloaded to listeners' hard disks. You'll notice that after listening to a broadcast with software such as RealPlayer or Windows Media Player, there is no option to save the broadcast to disk and if you search your hard disk, you probably won't find the streamed file.

As webcasts tend to be low quality, wanting to save music in this format is a little perverse anyway. However, it doesn't take a genius to figure out that if data is arriving at your computer, there must be software capable of intercepting it and routing it to your hard disk. And one such piece of software is the Voquette Media Manager which can be downloaded from www.voquette.com. Get it now before they ban it!

You may be wondering if anyone can set up an Internet radio station. The answer is yes, and the most popular software for doing so is Shoutcast which is available from www.shoutcast.com. It uses MP3 and it can deliver live broadcasts as well as audio-on-demand for archived broadcasts. Broadcasting is a little more involved than receiving but the site explains what you need to know and how to go about it.

A major obstacle to the rapid take-up of Internet radio is the ever-present cost of the telephone call when you're logged on. However, with the relatively recent launch of unmetered net access services such as the one offered by AOL – and the promise of more to come – Internet radio appears to be a much more viable proposition.

The promise of highly customised content – such as Sonicnet's My Station – could finally give us all the radio stations we really want and not what the broadcasters want to give us.

Sound and vision

The following are a selection of Internet radio websites that are worth a listen:

Antenna Radio www.antennaradio.com

Broadcasts around a dozen music programmes covering classical, jazz, punk, Japanese pop, experimental, contemporary, country and rock.

Billboard Radio

www.billboardradio.com

Music and information from the international music newspaper.

In Perpetual Motion

www.gothicindustrial.com

Gothic, industrial and electronic music.

Internet Radio Index

www.internetradioindex.com

Lots of links to lots of stations grouped by country.

There are also several sites containing station lists and links:

Google Web Directory

<http://directory.google.com/Top/Arts/Radio/Internet>

Hundreds of radio sites covering dozens of categories.

Internet Radio List

www.internetradiolist.com

Lots of stations across a variety of musical styles.

Kerbango www.kerbango.com

Vast range of station categories and advanced station search facilities.

Radio Tower www.radiotower.com

Over 1,300 stations.

Sonicnet <http://radio.sonicnet.com>

Includes a really neat My Station feature to let you create your own customised radio station by selecting music categories you'd like to hear.

Spinner www.spinner.com

Over 140 channels with 350,000 songs.



Top: There are station lists and search facilities at Kerbango

Middle: Radio Tower has its own browser-based radio player

Bottom: You can create customised broadcasts with Sonicnet's My Station

Virtual Reference Site Audio

www.virtualfreesites.com/reference.audio.html

Links to stations and other sites of interest.

Web-Radio www.web-radio.com

Over 4,200 stations.

CONTACTS

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Priced less artifacts

Ken McMahon removes the fuzz from his jpegs with the help of version 7 of Paint Shop Pro

Regular readers will know that at this time of year I like to do a bit of seasonal shopping and check out which goodies can be got from the web either free of charge or for a modest fee.

There are two ways you can benefit from this. If, or perhaps I should say when, your haul of Christmas goodies has yielded the usual disappointing results you can retire to the study and make yourself a gift of something worth getting excited over.

Alternatively, if that special someone in your life is the kind of pathetic soul who's likely to get more excited about a Photoshop plug-in than a *Simpsons* matching sock, tie and underpants set, then this is the place to do your Christmas shopping.

Unfortunately, I hadn't got very far with my Christmas shopping when I discovered version 7 of Paint Shop Pro, JASC's low-cost, but powerful and hugely popular, image editor. The feature line-up looked so impressive that I couldn't resist the temptation to download and check it out for myself. Two and a half hours later – the 30-day evaluation version is a massive 33MB, (luckily, the clock doesn't start running until after the download and install is complete) – I was ready.

PSP 7 has a number of new features including automatic enhancement filters, scratch and red-eye removal, gradients, patterns and textures on vector strokes and fills, new effects filters and an HTML image slicer. But what caught my eye was the jpeg artifact removal tool.

Jpeg artifacts arise when you apply too much jpeg compression to an image. Being a 'lossy' format, jpeg compression removes colour data from an image file. In most cases the loss of this data is



Screenshot 1



Screenshot 2

imperceptible to the human eye, but if you ladle on the compression or, as more commonly happens, repeatedly resave a file using jpeg compression, the data loss becomes apparent as blocking or pixellation in flat colour detail, particularly at contrasting edges.

To find out how effective PSP's artifact removal tool was, I decided to create some jpeg artifacts in an image by resaving it several times with the highest compression setting available.

Here's where I got my first surprise. Having

Left: PSP 7's maximum compression had a rather serious effect on image quality – so be warned, go easy on the compression slider

Below left: The original image

saved the file only once, I opened it to discover the picture to the left – I think you could say there is some visible loss in image quality there, though

to describe it as an artifact is something of an understatement. The original image is the one below it.

Most image editors (Photoshop, Photo Paint, Fireworks *et al*) keep the maximum jpeg compression well within the limits of visible degradation. With PSP 7 I'd set my phaser on stun and vapourised the target. So be warned, and take it easy with that compression slider.

On my second attempt, I noticed a Run Optimiser button on the jpeg options dialog box. Given the industrial-strength jpeg compression this is an absolute essential, it shows what happens to your image as you drag the slider up towards the 100 mark and gives file size and download time



Screenshot 3

This is fairly typical of the sort of artifacts you get if you resave compressed images from a digital camera in jpeg format

comparisons. Jpeg artifacts start becoming visible, in this image at least, once you pass the 50 mark.

This time I resaved the image with a compression setting of 75 – this introduced noticeable blocking in the flat tonal areas on the biscuit-coloured front of the building and the blue sky, as well as that horrible grubby-looking pixellated effect on the contrasting edges (Screenshot 3). This is fairly typical of what you get if you use a high-compression setting on a digital camera then resave (and recompress) the pictures in jpeg format after downloading them.

Jpeg artifact removal is on the Effects, Enhance Photo menu. When you select it a dialog box provides four strength settings and a restore crispness slider, which you can use to compensate for the softness that the artifact removal process introduces. Two thumbnail views show you the before and after states.

I tried the default settings – normal strength with 50 Restore Crispness and, to my great surprise it worked very well indeed (Screenshot 4), managing to remove the pixel blocking without an appreciable loss of detail.

One of PSP 7's other new tools, also under the Enhance Photo menu, is red-eye removal. Many home digital



Using PSP 7's jpeg artifact removal on the default settings gave very pleasing results

PSP's red-eye removal, however, deserves mention if only for its unique and unusual approach. PSP actually overlays a complete substitute eye in place of the original. To be fair, a huge degree of control is provided. There are human and animal eye variants in a variety of hues, each with 15 shading presets. Sliders control everything from pupil size and glint lightness to feather, blur and iris size. Finally, a refine slider controls the opacity of the substitute eye, so you can blend it in for a (not very) natural effect.

The default settings worked very well, removing pixel blocking without loss of detail

darkroom packages offer a one-touch red-eye correction feature for obvious reasons – red eye is almost inevitable when using a compact camera (digital or analog) with a built-in flash.

Red eye occurs when light from the flash enters the eye and is reflected from the retina and is quite straightforward to remove without the need for special tools. The mistake people often make is to try and colour the pupil (the black central part of the eye) or the iris (the coloured part of the eye surrounding the pupil). All you need to do is select the red pixels using the magic wand tool, adjust the tolerance and use grow or expand to get an accurate fit. Set the saturation to zero using either the colourise or hue saturation and lightness controls. This gives a more natural white highlight on the pupil and is all you need really do.

If retouching portraits so that the subject looks drug-crazed and murderous is what you're after, and I can highly recommend this, the results look every bit as 'natural' as a biro moustache. If you want to remove red eye with natural looking results my advice is to stick with the manual method. But don't be put off



Paint Shop Pro has proved to be popular

PSP 7 – in most other respects it's an excellent upgrade, well worth the download time.

Now, about that shopping list. Time's running short so it'll have to be a whistle-stop tour of the current top shops.

Head on down to www.markzware.com for a time-limited demo of FlightCheck, which will help you make sure there are no nasty surprises lurking in your QuarkXPress,

PageMaker, Illustrator, or Freehand files before you send them for commercial printing. You can also get a demo of FlightCheck Collect and, for those with serious pre-press content and workflow demands (you know who you are), MarkScout.

A wide range of useful demo software including Intellihance Pro (which will make a better job of sprucing up your pics than PSP 7), Mask Pro for professional quality cut outs, Photo-Frame, PhotoTools, Portfolio and QX Tools, is available at www.extensim.com/products. There's also a small freeware section including PhotoBevel and PhotoText 2 and the Portfolio browser.

At www.asy.com you'll find Acute systems which produces CrossFont and TransMac. CrossFont converts PostScript Type 1 and TrueType fonts from Mac to PC format and vice versa. TransMac lets you read Mac formatted discs – floppies, CDs, Zips, Jazz, optical, whatever. A useful combination.

Don't forget that the big boys – Microsoft, Adobe, Macromedia, Corel, Ulead, MGI, Scansoft, etc – mostly provide either time-limited or save-disabled demos for download as well as free updates and utilities.

Lastly, the graphics download section of vnunet.com: www.vnunet.com/download/graphics is well worth a look.

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Big game hunting

Benjamin Woolley finds some awesome facilities in the eccentric layout of Blender version 2

Blender (noun): an open-source software application, over-use of which can be highly addictive but mentally disorienting, as in 'Going on a blender'. When the first version of this extraordinary package came out, I received several emails from bewildered readers asking what on earth it was and how it worked.

From the moment you expand the Zip file (which you can download from the Blender website at www.blender.nl) into a folder, it's obvious that this program is different. There is no installer, let alone uninstaller, no shortcut appears in the Start menu or on the Desktop. You just double click on the blender.exe file and, hey presto, you and your machine enter the strange Blender world of mysterious icons and hidden menus.

The fact that Blender exists as a standalone program has one huge advantage: it will run on just about every OS and platform imaginable, from BeOS to Linux, including, of course, Windows (a Mac version awaits the introduction of OS X). In fact there is only one piece of system software that Blender demands: OpenGL (this comes as standard with Windows 98 and most other operating systems), and one piece of hardware: a three-button mouse (though you can emulate a third button on a two-button mouse by pressing the left mouse button and the ALT key at the same time).

The first version of Blender attracted more than 100,000 registered users. And now we have version 2, or gameBlender as it is sometimes called. This new release is extremely important to the development of the whole Blender project and to the 3D graphics community as a whole.

Blender 2 seems, on first acquaintance, to be very much like

Blender 1. When you first run the program, the display is indistinguishable from the first version. But, what's this? A series of menus appears along the top of the screen, labelled File, Edit, View and Tools – just like you find on other programs. Could it be that Blender has joined the mainstream and adopted a recognisable, user-friendly interface?

No such luck. The menus, though welcome, have obviously been bolted on as a concession to newbies. They appear in the Info window or panel, which is the only one that's been substantially changed. The other windows or panels

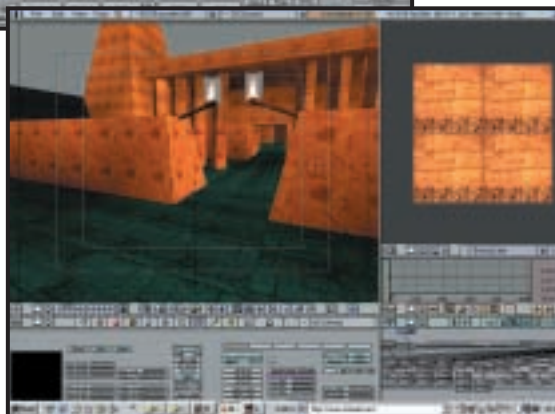
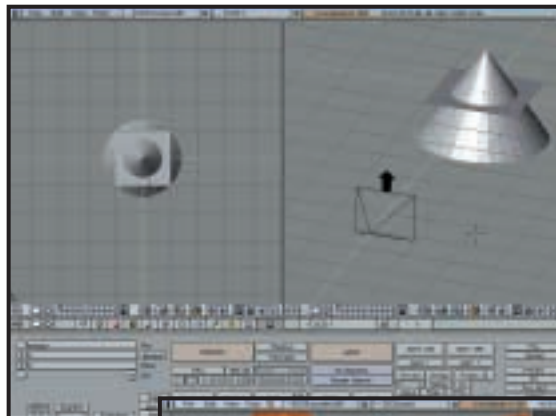
are much the same as they were on version 1, preserving most of the peculiarities. For example, in the 3D window, you still have the strange crosshairs or 3D cursor, which can be used as a local axis for creating and editing objects. And there are still endless keyboard shortcuts to remember; finger-knotting combinations of Alt, Ctrl, Numpad and other keys that unlock the truly awesome range of facilities hidden within the software. I had hoped that with version 2 there would be a handy list of key assignments that would pop up if you pressed, say, F1. The little question mark that appears in the top right-hand corner of the Info panel looked promising, but that turned out to provide another means of invoking the pop-up menu (which also appears when you press the space bar).

So, those planning to download Blender 2 in the hope of finding a recognisable interface need not bother. It is as quirky (and for devotees; as beautiful) as it ever was.

However, anyone interested in having a go at creating computer games for themselves should go and grab that Zip file as quickly as they can (it won't take long, as it takes up less than 1.5MB, which in itself is a miracle). Blender 2 is nothing less than a games development platform, and it is, at least at the time of writing and for the foreseeable future, absolutely free.

The core of the games engine is what the developers of Blender 2, NaN, call a 'solid-body dynamic simulation'

system. This can be used to give objects within a scene behaviours that simulate physical effects such as gravity, impacts from weapons, character interactions, collisions and so on. The interface for achieving these effects is, like the rest of the package, unconventional, but it is quite elegant and should be accessible even to (determined) novice 3D users.



Top: The bewildering Blender 2 interface hides a considerable degree of 3D sophistication

Bottom: The 3D window shows a demo game developed using the Blender 2 game engine; by pressing 'P' the engine can be started, and the game played (in this case a simple walk through an Egyptian tomb steered using the arrow keys)

The basis of creating a game is to build a scene populated with objects given particular behaviours. These objects fall into two classes: 'sectors', which are really spaces in which the game takes place (though you can have more than one sector in a game – for example levels could be distinguished using sectors) and 'props' and 'actors', which are the objects and characters that interact within the game (the difference between props and actors is that actors can move between sectors). These objects are created as they would be for a static 3D scene; the difference is that after creating them, you invoke the Real Time window (by pressing F8 or the button with a Pacman face on it) and give them dynamic properties.

The dynamics or behaviours are determined by giving the objects sensors, controllers and actuators. For example, you can give a prop object a sensor so that it 'senses' a press of the up cursor key on the keyboard and passes on the information to an actuator, which can actuate a response, such as applying a Y-axis or upwards force. When you then hit the P key to 'play' the simulation, you should then see the object ascend every time you press the up arrow.

Such control mechanisms are represented in the Real Time window in the form of a flow chart, with blocks representing sensors and actuators, and lines showing how information passes between them. The flow of information is co-ordinated by 'controllers', which can be used, for example, to combine the input from different sensors to trigger different actuators.

Once you have mastered the necessary concepts and key assignments,



it does not take too long to start creating simple games using gameBlender. There are, however, a few limitations. The first is that you will need to look at several online tutorials to get a grounding of the game engine principles, and though the ones available on the Blender website are quite easy to follow, they only show you the basics. In-depth manuals and tutorials will be available in printed form for version 2 (check the website), but you will have to pay for them.

Another limitation is that, at the time of writing, there was no run-time Blender engine. Games can only be played from within Blender itself, and they run very slowly. This is the one area where Blender's cross-platform capability creates problems. For fast games, you need optimised engines, and the most efficient are those that are designed for particular hardware. The last limitation is that Blender has difficulties

An impressive example of the sort of image that can be generated using Blender – if you have the imagination and skills. This was created by John Walton and shown in the Blender website gallery

with certain 3D cards. It froze my Windows 2000 system when I tried to run it with a Matrox G400 MAX graphics card, for example.

On the plus side, you could soon see your games running like the wind on Sony's new PlayStation 2. Sony and NaN have signed an agreement which means that Blender games can be exported in the PlayStation 2 format, although whether you will be able to do this with the free version of Blender was, at the time of writing, unclear. Either way, Blender 2 has already opened up game authorship to the world and the world should be deeply grateful.



Blender's beginner's page contains basic but essential information on installing and using the program

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Kylix takes centre stage

Tim Anderson discovers more about Borland's cross-platform Delphi project

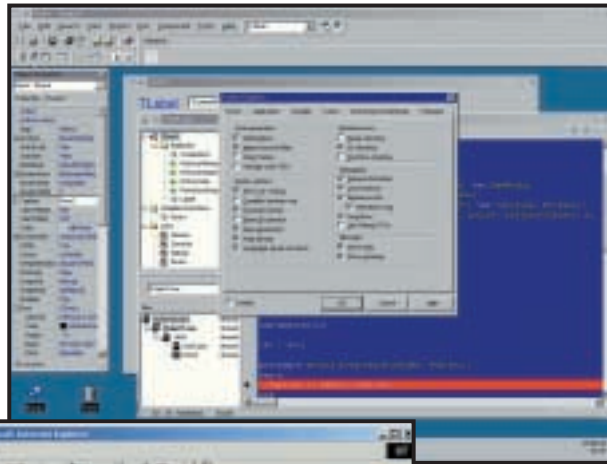
Long-term PCW readers will know that, when pushed, I normally recommend Delphi as the best all-round development tool for Windows. The 'for Windows' rider was once hardly necessary, as most readers were developing for Windows. However, while the majority of you are still using Windows as your primary operating system, the development landscape is changing.

Java is best thought of as a platform in its own right, while the combined force of the Internet and Linux means that many developers are targeting Unix-like operating systems. So where does that leave Delphi? It remains hugely impressive, but Borland is losing interest in keeping up-to-date with the latest features of Windows and is instead concentrating on cross-platform technology, which means JBuilder, the Java development tool, and a new cross-platform Delphi code-named Kylix.

Kylix revealed...

The Kylix project is not just Delphi for Linux, although this will be the first product to emerge. The Borland Developer Conference in London at the end of September was one of a number of recent events where some details of Kylix were presented to the assembled masses.

The big question about Kylix has always been how the VCL (Visual Component Library), which is in essence a class library wrapper for the Windows API, could ever be ported to another operating system. The answer is that it uses a new class library called CLX (pronounced 'clix'), which stands for



Here comes Kylix. This Borland-supplied screenshot shows an early Kylix preview running on KDE. It looks like what it is: Delphi for Linux

making it possible to develop open-source Kylix applications. I spoke to David Intersimone, Inprise's vice-president of developer relations, who said: 'If a

developer wants to do closed-source development with Project Kylix, then there is our standard licence agreement and a set of redistributable binaries.

'We also have a modified GPL licence, approved by Richard Stallman, Eric Raymond and others, which allows you to do open source development. We will provide the source to CLX, and offer a toolset that lets you take an open source project, even if you don't have Kylix, and still do something with it.' While the details were not available at the time of writing, this probably means either a freely available command-line compiler, or a simplified IDE along the lines of JBuilder Foundation.

Borland is embracing SOAP (Simple Object Access Protocol), which is a means of accessing remote objects over HTTP using an XML standard. Using SOAP, applications running on Linux can communicate with Windows applications, or presumably an application on any platform that exposes SOAP services. Since IBM, Sun and Microsoft will also support SOAP in their developer technologies, this promises to be a great solution for simple distributed applications. Among other things, a SOAP-based database driver for Microsoft SQL Server 2000 has been mentioned, allowing Kylix clients to access data on a Windows 2000 server.

Sadly, the dream of simply opening your Windows VCL project in Kylix and recompiling it for Linux will remain a dream. Instead, Windows Delphi



At the heart of Kylix is Qt, the cross-platform C++ library from Trolltech. If you want to build cross-platform Delphi applications, you will need Qt installed even on Windows

Component Library for Cross-Platform. CLX uses TrollTech's Qt to provide a graphical interface for both Windows and Linux. Qt is a C++ library designed specifically to enable cross-platform user interface code.

CLX will have four modules: BaseCLX contains generic classes and procedures that are shared between CLX and VCL; VisualCLX is the GUI class library based on Qt; DataCLX is the database library and NetCLX handles Internet components.

Linux is an open-source operating system and a common question is whether or not the Linux community will accept the kind of proprietary commercial tools that succeed on other platforms. Borland is addressing this by



You can build cross-platform help using Bristol Technology's HyperHelp, which can compile the same source documents as Winhelp. HyperHelp is expensive, so the other option is simply to use HTML

developers, from Delphi 6.0 onwards, will need to choose whether to develop with VCL or CLX. A VCL application will be Windows-specific, while a CLX application is cross-platform. At some future date, cross-platform is likely to mean more than just Windows and Linux, and other Unix platforms are probably not far off.

Porting problems

Kylix looks much like the Windows version of Delphi and brings equally rapid object-oriented development to Linux. When it comes to porting an existing Delphi project though, there will be a number of challenges. It is still Object Pascal, so most non-visual procedures will run fine.

Equally, simple forms using standard widgets should be easy to port. Database applications might port easily, but there is no BDE (Borland Database Engine) on Linux, so if you use Paradox or dBase database files you will have to convert to a database such as InterBase or MySQL.

A big issue is porting visual code that uses direct calls to the Windows API. Owner-draw is not supported, although CLX does have a TCanvas object similar to the current VCL TCanvas. COM and ActiveX are nowhere to be seen in Kylix, so if a critical part of your Delphi application is a COM automation interface or third-party ActiveX control, you may have a lot of work on your hands.

The bottom line is that most real-world Delphi applications are not going to be quickly and easily ported, although it will be significantly better than starting from scratch. More positively, Kylix will

FIG 1

Visual FoxPro code to read an Access MDB

```
#define dbOpenTable 1
#define dbOpenDynaset 2
#define dbOpenSnapshot 3

dbengine = createobject ✓
("DAO.DBEngine.36")
db = dbengine.workspaces ✓
(0).openDatabase("c:\my ✓
data\cdlist.mdb")
sSQL = "select * from ✓
titles, artists where ✓
titles.artistid = ✓
artists.id"
sSQL = sSQL + " and ✓
artists.name = 'Oasis' ✓
order by titles.title"

rs = db.openrecordset ✓
(sSQL,dbOpenDynaset)
rs.movefirst

do while not rs.eof
? rs.fields("title").value
rs.movenext
enddo

rs.close
db.close

(Key: ✓ code string continues)
```



Get at Access data from FoxPro, using code to manipulate Data Access ObjectsGet

enable Delphi developers to use their existing skills to build new Linux or cross-platform applications. In addition, CLX enables Windows developers to hedge their bets by designing applications that use Qt, making it ready to port to Linux at some future date.

With Borland's energies going into cross-platform development, Delphi's status as the premier Windows development tool is under threat. The relationship between Microsoft and

Inprise/Borland is a curious one. Microsoft has a 10 per cent stake in Inprise, which is number two in the market for Windows tools.

At the same time, years of frustration in trying to compete with Visual Basic and Visual Studio have left their mark on Borland. A senior Borland presenter at the London conference used an image of Linux penguins dancing triumphantly over a Windows-shaped iceberg as his desktop background.

This ambivalence is reflected in the company's statements about future plans. I asked Dale Fuller, Inprise president and chief executive officer, whether a future Delphi would support Microsoft's .NET and the CLR (Common Language Runtime) at the heart of the next Visual Studio. 'Yes, absolutely, we have to,' was his reply.

At the same time, Delphi is conspicuously absent from the list of languages that will compile to IL (Intermediate Language), the byte code format used by the CLR.

David Intersimone is more guarded. 'We also have to look and see what makes business sense,' he said. The impression is that while Borland will do what is necessary to keep Windows market share, it is also campaigning to persuade developers to move towards cross-platform solutions.

Details of Delphi 6 have not been announced, although CLX support is clearly one essential new feature. There is also talk of web pages using server-side Delphi script.

It seems likely, though, that viewed simply as a Windows development tool, Delphi will fall increasingly behind Visual Studio. By way of compensation, it will be ideal for those who want an escape route from Windows dependence, and an easy path to low-cost Linux deployment.

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More Kylix information is at

www.borland.com

You don't have to wait for Kylix to use Qt, which can be found at www.trolltech.com

Cross-platform Hyperhelp is at

www.bristol.com/hyperhelp



Tomcat sharpens its claws

Tomcat could be the Java web development platform we've been waiting for, says Tim Anderson

Sun's answer to Microsoft's Active Server Pages, JavaServer pages (JSP), offers two main features. First, you can embed server-side Java within an HTML page, in the same way that you would embed the VBScript of JavaScript in an ASP page – the difference being, this is real Java, not JavaScript. Second, and most importantly, you can invoke server-side JavaBean components and, just as with ASP, server-side COM components. These JavaBeans use the Servlet API, providing access to useful web development features such as the HTTP request header, cookies and posted form data.

There's also support for sessions, which are a way of identifying a series of connections from a particular user as being part of a single session. Sessions use either cookies or URL data to keep track.

A Servlet is a server-side Java component that understands how to handle web requests and return a response to the browser. You can use Servlets without using JSP – for example, by entering its file name directly into a URL, just as you can with a CGI script. In fact, JSPs are compiled into Servlets. The benefit of JSP is the ease with which you can mix static HTML with server-side components.

JSP with Servlets is a highly significant technology. Like ASP, it overcomes problems of deployment and platform dependence. You can develop JSPs that deliver pure HTML, reducing client requirements to a minimum. There's also an easy route towards supporting other types of client – for example, WAP mobiles. JSPs separate presentation from application logic, and because they are compiled to Java byte code, performance is better than with interpreted script.



Left: Visit the Jakarta website and download the latest Tomcat binary build



If you get this web page, your local Tomcat installation has been successful

Take-up of JSP/Servlet technology was initially held back by the need to run either Sun's Java Web Server, or to install an add-on such as Allaire's JRun so that you could extend a web server with JSP support. Sun then supplied the JSP specification to the Apache Foundation so it could develop a reference implementation that would be freely available (including for commercial use).

The name of this project is Jakarta, and its primary product is Tomcat. This JSP server can either run as a standalone, or be integrated into a web server, including the all-conquering Apache. Sun has nevertheless retained ownership of the Servlet and JSP specifications.

Tomcat is likely to catch on in a big way as the ideal – and free – platform for developing Java-based web applications.

Using Tomcat

The easiest way to use Tomcat is to take a trip to the Jakarta website to download the binary version of the

latest release build. Tomcat is itself a Java application, so you also need to install a recent JDK (Java Development Kit), with JDK 1.1 being the minimum requirement.

Once Tomcat has downloaded and expanded, set the tomcat_home environment variable to the directory where you installed Tomcat. Check that java_home gives the top JDK directory, and that the Java interpreter (java.exe) is on the path. Run the supplied start-up script, which is a .sh file on Unix and a batch file on Windows.

You should now be able to open a web browser window and enter <http://localhost:8080/> into the address bar, which will call up the Tomcat home page. Try the example Scriptlets and .jsp pages – if the Scriptlets work, but the .jsts do not, check that java_home is correctly set (the JSP engine uses javac and must be able to find it).

What you have installed is a standalone Tomcat, which is in effect its own web server. Because it is on port 8080, as opposed to the standard web server port 80, it will not interfere with another web server running on the machine. This type of installation is great for developing Tomcat applications, but for real-world use, Tomcat should be combined with a standard web server. If you are using Apache, the solution is to install the mod_jserv module. Again, this can be downloaded from the Jakarta website, in either binary or source form,

and there are also detailed instructions on configuration.

JSP Scriptlets

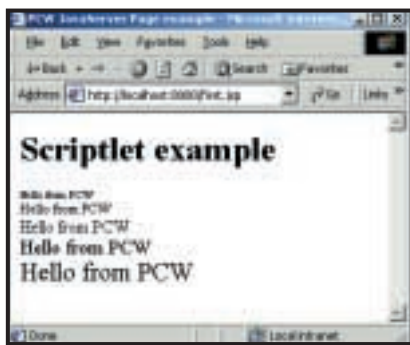
Once Tomcat is installed you can start using Servlets and JavaServer pages. JSP Scriptlets are scraps of Java embedded within HTML – figure 1 shows a simple example. Save this as first.jsp, in the root directory of the Tomcat tree, and point a browser at <http://localhost:8080/first.jsp>. If you view the source, you will see that only HTML is delivered to the browser – no Java applet is involved. Looking again at Figure 1, note that all the server-side Java is within `<%` and `%>` delimiters. When a `<%=` delimiter is used, the Java output is sent straight to the browser.

Intrinsic objects

Like ASP, JSP has intrinsic objects. JSP pages are themselves compiled to Servlets, so it is not surprising that these objects are closely related to the Servlet API. For example, the request object is an instance of the `HttpServletRequest` object.

Here is how you might use it to retrieve the value of a URL querystring:
`<%= request.getQueryString() %>`

Other intrinsic objects are: `response` (`HttpServletResponse`); `session` (`HttpSession`); `application` (`ServletContext`); `out` (`JspWriter`); `config`



The output from a simple JSP running a Java scriptlet

(`ServletConfig`); and `page`, which is an object representing the current page.

JSPs also support an exception object. You create an error page, including the following code at the top:

```
<%@ page isErrorPage=true %>
```

and something like this within the body of the page:

FIG 1

JSP Scriptlet example

```
<html>
<head>
<title>
```

JavaServer Page example

```
</title>
</head>
<body>
<h1>
```

Scriptlet example

```
</h1>
<%
for (int i = 1; i < 6; i++) ✓
{ %>
<font size= <%=i%>>Hello ✓
from PCW</font><br/>
<%
}
%>
</body>
</html>
```

(Key: ✓ code string continues)

```
<%= exception.getMessage() %>
```

The `<%` delimiter indicates that this is a directive, which sets the attributes of the page, rather than Java code to be executed. This one designates it as an error-handling page. In other pages, you can now set the `errorPage` attribute to point to the error page. The following assumes you saved the error page as `myerrorpage.jsp`:

```
<%@ page errorPage="myerrorpage.jsp" %>
```

Now you can use the exception object of type `java.lang.Throwable`:

```
<% if (someerrorcondition) {
throw new Exception("Some error...");
} %>
```

The error page is sent to the browser and the message turns up in the `getMessage` method of its exception object.

Beans and Servlets

In order to get a fuller picture of what JSP can do, it is vital to look at how you can invoke an external Java component.

Scriptlets are not intended to contain complex logic, but rather to perform simple utility functions. More involved processing is taken care of by Beans and Servlets, which are Java components that can be invoked by a JSP.

Figure 2 shows an example Bean. It

FIG 2

Code for Bean

```
public class HandsOn {
public String getMessage() {
return("Hello from a simple ✓
bean");
}
}
```

FIG 3

Code for useBean.jsp

```
<html>
<head>
<jsp:useBean id="mybean" ✓
class="HandsOn" />
<title>
PCW useBean example
</title>
</head>
<body>
<h1>
useBean example</H1>
<p>The bean returned:
<jsp:getProperty name=✓
"mybean" property="message" ✓
/></p>
</body>
</html>
```

could not be simpler, supporting only a single property and returning a string. Save this in the `root/web-inf/classes` directory in the Tomcat tree, and compile it to create `HandsOn.class` in the same location.

Figure 3 shows `useBean.jsp`, which invokes the component. Save this in the root directory, and point the browser at <http://localhost:8080/usebean.jsp>. You should see a page like that in the screenshot on the following page. The key elements are the lines:

```
<jsp:useBean id="mybean" ✓
class="HandsOn" />
and
<jsp:getProperty name=✓
"mybean" property="message" ✓
/></p>
```

These are called JSP Actions, and use XML syntax. The `useBean` action tells JSP to load a JavaBean and specifies the class required, along with an ID. It also has a `scope` attribute that lets you control the context of the bean. The default is `page`, which means that the bean persists only on the current page.

Other scope settings are `request`, `session` and `application`. The `getProperty`



Inside JBuilder 4.0

JBuilder is a visual development tool for Java, originally patterned on the company's Delphi product for RAD Windows applications. JBuilder is itself written in Java, and is certified to run on Windows, Linux and Solaris. The base version of JBuilder is available for free download and, according to Borland, more than two million developers have taken advantage of this.

A long-standing problem with JBuilder is the slow performance of its IDE, which can be mitigated with appropriate hardware – for example, a Pentium III 700 with 256MB of RAM. However, you may be happy with performance on lesser hardware, particularly when using the cut-down JBuilder Foundation.

At the same time, it can be a relief to turn to a native-code programmer's editor and the command-line Java SDK after working with a heavyweight IDE like JBuilder. The same comments apply to other Java

development tools such as IBM's VisualAge and Sun's Forte for Java.

JBuilder 4.0 cannot be described as a radical new release, but it is a more polished and mature product than its predecessors. The highlight of the new release is its extensive support for Java Servlets and JavaServer pages, including integrated Tomcat 3.1.

Unfortunately, while Servlets are fully supported in the Professional version, JSP features are reserved for the Enterprise edition. With this, you can debug JSP source directly. Along with wizards for Servlets and JSPs, JBuilder has InternetBeans Express, a quaint name for a set of components for building dynamic web pages. These link with DataExpress, the core database components in JBuilder, forming a complete RAD toolkit for Java-based web application.

The JBuilder IDE has been overhauled, and a significant improvement is



the ability to open more than one AppBrowser and navigate between them using the Window menu. The AppBrowser is at the heart of the IDE, and the effect is similar to opening a second instance of JBuilder, but with full code synchronisation. A redesigned File Open dialog has a split window and lets you drill down into zip and jar archives. The numerous debugger enhancements include neat touches such as tooltip variable inspection.

Enterprise developers benefit from built-in support for BEA WebLogic Server as well as Inprise Application Server. A new set of wizards

simplify building and modelling EJBs (Enterprise JavaBeans). There is also integrated support for CVS (Concurrent Versions System), a popular freeware version control system. Curiously, there is no version control support in the Professional version of JBuilder, which is a sad omission. There is also no built-in SOAP (Simple Object Access Protocol) support as yet, possibly because the standard is still evolving.

This is a worthwhile upgrade and the new JSP and Servlet features are great if this kind of development figures in your plans.



The results of invoking a simple bean in JSP

action has a name attribute that matches the ID of the bean, and a property attribute that states the name of the property to be invoked. Other JSP actions are setProperty, which writes a property value – include when inserting an external

page, and forward for forwarding a request to another URL. Servlets are beans that extend the HTTPServlet class and have access to the Servlet API. Creating Servlets is more complex, but in principle, the process is similar to that described above for a simple bean.

JSP or ASP?

If you are starting with a clean sheet, should you choose JSP or Microsoft's ASP? There is no simple answer, but here are some considerations.

If your web server is Unix-based, JSP is the best option for component-based web application development. On Windows, Microsoft offers a complete application architecture based on COM, so it makes sense to use this unless you have a good reason not to – for example, if you want to code in Java.

ASP lets you code in the language of your choice, providing it supports COM or ASP+, the Common Language Runtime. ASP is also easier to pick up initially.

CONTACTS

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webdev@pcw.co.uk

Examples from this column are posted at

www.itwriting.com/pcw/

Find Tomcat at <http://jakarta.apache.org>

Further information on JavaServer pages and Servlets can be found at

<http://java.sun.com/products/jsp/>

JBuilder Foundation is at

www.borland.com/jbuilder/foundation



Pay-by-phone solutions

Nigel Whitfield asks what alternatives are available when credit card payment is not viable?

Although setting up your ecommerce site can take quite a lot of work, there are plenty of tools to help you do it – and next month I'll be returning to some of those. However, one of the things that can prove most problematic is the thorny issue of how you receive payment.

A business that operates through a shop or via mail order can quite easily make do with cash and cheques, but on the Internet, plastic is king. Few surfers will want to write out a cheque and pop it in the post. But for a small company, or maybe a club that wants to sell merchandise such as T-shirts, the costs involved in becoming a merchant and paying for each credit card transaction, not to mention the possibility of charge-backs – where you end up repaying a card company, because a transaction has been invalidated – may mean that it's simply not viable.

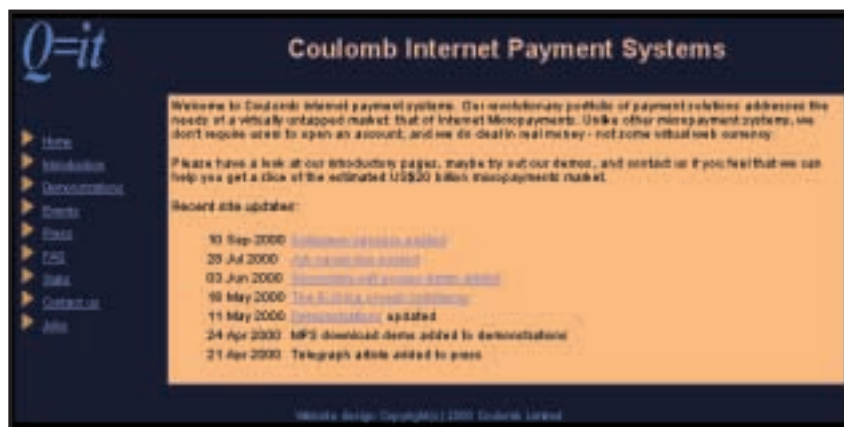
For many years, the Holy Grail of ecommerce has been micro billing. This, in theory, allows people to be charged a small amount – maybe 20 or 50 pence – for viewing information online. You could, perhaps, charge such a small amount for people who want to read a

The applet disconnects your web session then reconnects you via a premium-rate number

fact sheet, or a news analysis article. With even lower amounts, why not charge for every page on your site?

Of course, the big problem here is the cost of the billing. You may be able to track a visitor around your website and total up an amount based on the pages they have viewed, but with some card companies charging £2 for a small transaction, it's still not a reasonable solution.

However, there is a growing number of sites that are using an alternative to credit cards for billing users – the phone system. There is a wide range of premium-rate telephone services



Coulomb is one of several companies offering micro-billing using the telephone system

available, with charges either by time or as a fixed fee per call.

It's often said that the porn industry is the first to adapt to new technology, and it's certainly spotted the potential in premium-rate phone numbers. Typically, when you visit certain sites, you will download a special dialler applet onto your computer. Running that applet – and in some cases it may run itself – disconnects your Internet session, and reconnects you, using a premium-rate number, to the servers on which the content you want to view is stored.

At the moment, the most expensive calls that are possible cost £1.50 per minute. The most expensive fixed-fee call is 75p. So, if you want to charge £4 to view a report, then you need a dialler applet configured to keep the caller connected for four minutes. Obviously, the more expensive the product, the longer the wait, and the more infuriated the customer is likely to become.

It will come as no surprise to regular readers of *PCW* to hear that calls with higher fixed-rate fees that may allow people to buy things such as a CD, need the agreement of BT before they can be introduced, since most of the

premium-rate operators rely upon BT to generate bills.

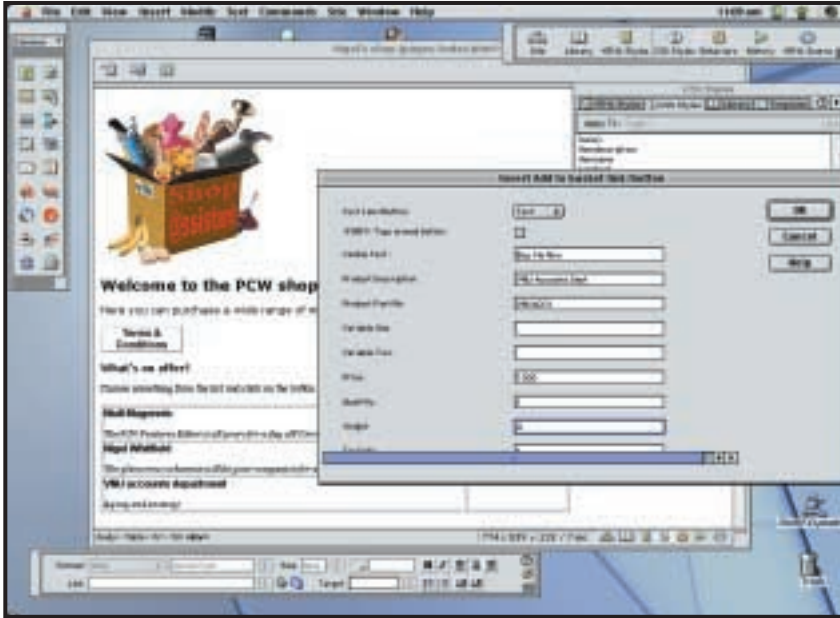
Technology at the ready

The technology is readily available – for example, Magenta Systems (www.magsys.co.uk) has an ActiveX control that can be used to make a customer's computer dial a premium-rate number, clearly displaying the total cost incurred on the screen.

An alternative solution – and one that that may be important if you want to sell to people who do not connect via a modem – is to have a premium rate number that people can dial to be told a password or code number, which they can then enter into a browser to access information. Coulomb (www.coulomb.co.uk) has a system that includes this feature.

Can you do all this more easily than setting up a credit card system? Premium-rate phone numbers are more readily available and, depending on the number of calls, you may receive between 50 and 80 per cent of the call cost. However, such numbers are regulated by ICSTIS and fall into the category 'services with a visual element', which means that approval is necessary before starting such a service. The good news is that approval is based on the phone number, so you would need approval to sell newsletters, for example, but not for each individual newsletter.

Obviously, a fair chunk of the money



charged on the phone bills won't be coming your way. Nevertheless, people who want to sell information on their website may find that this is a technique worth investigating further, as, for small items, it could prove much more straightforward than processing credit cards with their minimum fees and charge-back risks.

Of course, there are other drawbacks.

The simplest solution is to use the customer's browser to save the information you need

At the moment, it's not easy to do this sort of thing for international sales. Additionally, while people can use a phone to make a call if they have a permanent Internet connection, those with mobile phones or in offices may find that premium-rate numbers have been barred. Employers are not likely to be too willing, after all, to have their staff charging online purchases to the corporate phone bill.

Shopping basket woes

A couple of readers have written in asking about the shopping basket systems we've been looking at, and wondering if there's anything simpler that they could use. Since they sell only a few products, they don't want to have to spend time getting to grips with a system such as Shop@ssistant or MiniVend.

If you have a look around the web,

you'll find plenty of scripts, in assorted languages that you can use to do the job. The alternative is to 'roll your own'.

That might sound like a lot of work, and if you want to go the final mile and interface it with a credit card processing network, then it certainly will be. But the readers who have written in don't require live links – just a way of

collecting the information for an order to be processed offline, which for many small businesses is still the simplest way of handling transactions.

So, if you want to create a simple solution of your own, how do you do it? The easiest way is probably to use the customer's browser to save the information that you need. That's pretty straightforward if you're used to CGI programming. There are two tricks – first, you need to generate pages on the fly; second, the pages on which orders can be placed need to be forms, so people can fill in quantities and click the order button.

Rather than keep track of information on the server, you can use one of two solutions. The first is cookies, and the second is hidden fields in the web page. Why do you need both? Hidden fields will work as long as someone is

Some people with only a few items to sell prefer to find alternatives to shopping basket systems such as Shop@ssistant

submitting a form when they move from page to page. When a page is submitted via an order button, you can grab the form values in the usual way, and display a following page by sending it as the output from your script.

If the HTML for that page contains a line like this:

```
<INPUT TYPE="HIDDEN"
NAME="ORDERSOFAR" VALUE="--ORDERINFO--">
```

(Key: ✓ code string continues)

Then a line in your script (this example uses Perl) like this will update the page as you output it:

```
$_ =~ s/--ORDERINFO--/$orderinfo/;
```

This ensures that when the next page is submitted, the current basket contents, from \$orderinfo, will be sent, along with any new orders.

That's all very well, as long as people always move around using form links that trigger the sending of the values you've embedded in the page. But if you have ordinary links to other products, it won't work.

Trick number two is to set a cookie for each page, containing the same information. Don't set an expiry time so the cookies will die with the web browser. If the links call a script, instead of going directly to an HTML page, it can read the cookie and use it to set the hidden fields in the web page. Don't forget that you'll also need a unique ID for each transaction, to ensure that different customers don't get mixed up.

The exact details of how you implement this are, as they say, a small matter of programming. I'll put a sample script on my website at www.nigelwhitfield.com for those who want to investigate this further.

Remember, however, that although this sort of technique is fairly simple to implement, it's also not going to scale well. A roll-your-own shopping basket is strictly for small-scale orders.

CONTACTS

Nigel Whitfield welcomes your comments on the Ecommerce column. Contact him via the PCW editorial office or email ecommerce@pcw.co.uk



Gameboy gets connected

Games consoles that you can call your mum on are the future of mobiles, says Simon Rockman

The shape of the mobile phone of the future is being decided right now. One thing is for certain; it won't be a phone, it won't even be a PDA – it will be a wireless information device or WID. It will also be a wireless entertainment device or WED. The first glimmerings of such devices are just starting to appear.

It's heartening that mobile phone manufacturers are aware that WEDs represent a bigger potential market than WIDs. This means that in the future more people will be carrying around a device that looks like a Gameboy that has swallowed a phone rather than a phone that thinks it's a Palm.

The youth market is the most lucrative sector for mobile phone manufacturers. Young people may want stylish phones at low prices (or even for free) but they use them a lot. In fact, sweet manufacturers are blaming the first ever drop in the consumption of boiled sweets on kids buying phone cards over confectionery. Where dental hygiene is concerned, it's certainly good to talk. This is very much the news the networks want to hear; not only do they approve of healthy teeth, they love big phone bills. The bigger the bill the more they can subsidise the handset.

All of this is good news for the pocket games console of the future. A WED is likely to sport a high-power processor, something like an ARM or an ARC, one of the new organic electroluminescent colour displays, lithium-polymer battery, custom graphics chips designed for the low-power, low-resolution application and real killer applications – the kind where you fight aliens. What's great here is that WED makers will have two sources of revenue – software sales and online time. This means they'll probably sell you thousands of pounds worth of hardware for £100.

The games of the future won't be the traditional online games like Quake and Unreal Tournament. In fact, they can't be. Although, it's well-known that mobile phone networks have poor bandwidth, most run at 9,600bits/sec and leading-

edge technology struggles to reach 28,800bits/sec, this doesn't matter too much for games. What does matter is that mobile phones suffer from dreadful latency. Latency is the delay between data being sent and it being received at the server. You might be able to send a megabyte a second down the line but if it takes a minute to get through the network to the server you need to design applications with this in mind. Huge latency doesn't matter if you are sending Excel spreadsheets or photographs. It does if you are shooting another game player. Best-case GSM latency is 750milliseconds so by the time you've pinged off your ion blaster, Warp Darkmatter will have cooled his flame-thrower and moved off to terrorise another planet.

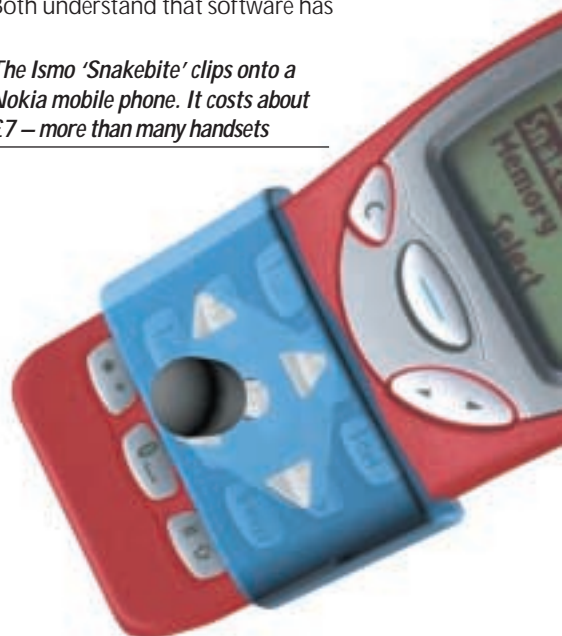
It's crucial to realise that the kind of game that can cope with mobile latency is very different from today's latest and greatest titles. Even simple games such as online breakout become impossible. It's not a problem that will be solved by technology either; GPRS doesn't improve latency and the high bandwidth UMTS phone systems due in 2003 still suffer badly from latency – although to what extent depends on which bearer service you use. The solution lies in game design. There are good influences to draw on, a vast history of very playable if graphically poor games from the mainstream Sinclair Spectrum to now almost-forgotten platforms such as the Dragon and Lynx. Even today Jet Pac is highly playable.

The only mobile phone manufacturer that has got this right so far is Ericsson. It's developed Tetris, a version of the arcade game QIX, and a Pacman-like game where you shoot the ghosts rather than eat them. Most games on mobile phones are poor; few are stunningly addictive although the Underground has a background noise of people playing Nokia Snake most mornings. History however is full of great single-player games, while there are few – perhaps Ant Attack – that could feasibly be converted to be two or more player games in a high-latency network.

What is needed is for someone to trawl the archives and find the games that would suit the environment. And it isn't just a technology thing either. The most played game in the world isn't Quake or Tetris, it's Windows Solitaire. Millions of hours are spent hoping the next card is a red five or whatever. The fact is, if you are producing WED for the mass market, the games have to suit the players. Future development is going to be led by an interesting combination of the games industry, which is fashion led and insular, and the mobile phone industry, which is led by committees and long-term strategy. There is a danger that the phone industry underestimates the games industry and thinks of it as a subset of the computer industry. This is dangerous because it isn't, the games industry is huge. Steve Ballmer, Microsoft CEO, once told me: 'We are the second biggest software house in Seattle', a reference to Nintendo, which is a short cycle ride from Microsoft. This may not be the case today since Nintendo is something of a fallen star but it explains why Microsoft is putting so much effort into the X-box.

Combining the working methods of the games industry and the mobile phone industry will be interesting. Both understand that software has

The Ismo 'Snakebite' clips onto a Nokia mobile phone. It costs about £7 – more than many handsets





Motorola's a009 Accompli recognises that colour screens and GPRS can be of more use to gamers than business people. This is a prototype, expect the real thing to be in bad-for-the-eyes colours

to be finished before it ships, you can't have patches and maintenance releases the way the PC industry does. The phone industry has to learn a lot more about ergonomics. You can build a phone that looks like a teddy bear, a can of Pepsi or a banana and it will still work. Get the button positioning wrong on a game controller and the thing becomes useless. The Ericsson A2618 plays a great game of Tetris, but it's ruined by you having to think about where the buttons go.

The plastics company Ismo has produced an add-on joystick for Nokia phones as a way to improve Snake scores. However, the best controller in the world, ergonomically at least, is arguably the new Sony PlayStation 2 controller. If you want to play games, the WED of the future should really look like that.

Some signs that the games manufacturers are getting it right come in the way they are setting the foundations for gaming. Ericsson, which produces the best single-player games around, is rumoured to have a pocket console in preparation. Motorola has poached Juan Montez, the number two in the Sony PlayStation organisation, to head up its gaming projects and Nokia is promoting www.pogo.com a web-

based online gaming network (you'll find me there playing Backgammon). One problem with multiplayer games is finding someone to play against. Building a critical mass of players is essential. I'll happily play against people from Istanbul, Iowa and Italy while I'm on my computer at home but would love to be able to do it from the top of a bus. The technology will make this possible, and what pogo offers is the rival players. You can log on any time of the day or night and there will be a few hundred people online ready for a game.

Playtesting online games is going to be difficult. A games company will typically have around 40 games testers working on a product before it ships. Introduce the vagaries of network play and then exacerbate that by making it mobile with a higher chance of dropped connections and it will need a huge investment of resources and expertise to get right.

At the moment the right kind of hardware is a little way off, but there are encouraging signs that it will appear.



The Blackberry from RIM is aimed at the business market – it's already a success in the US on a two-way paging network. Intel-based, it holds the promise of a gaming future



Organic electroluminescence is the screen technology of the future

Leading the way is Motorola, which has shown the a009 Accompli. This is the first attempt at a games device – although the button positioning is dreadful. However, Accompli's launch encourages third-party development by providing tools for developers – unfortunately it uses Java, which isn't the ideal language for creating the super-efficient code required for a game. The demonstration games are weak too – a crude version of Battleships is the best the company can muster. However, there are some aspects of the design which are right. It's got a big colour screen and supports GPRS.

Another device that is going in the right direction, although it's aimed at the business community, is the Blackberry. This is a GPRS device currently being developed by the Canadian company RIM and BT Cellnet.

Although it's early days yet, one crucial technology was shown by Motorola at a US show in September. It's the organic electroluminescent display. This gives very bright colours and uses very little power. The combination of ever evolving technology and the influence of markets will produce some amazing products but, as with the dawn of any new market, it's impossible to predict what they will be.

CONTACTS

Simon Rockman welcomes your comments on the pda and mobile devices column. Contact him via the PCW editorial office or email pda@pcw.co.uk



Giving VoIP a hearing

Roger Gann assesses the prospects for packet voice and the search for standards

Although e-mail is rapidly becoming pre-eminent, modern businesses are still heavily reliant on the humble telephone – a relatively antique technology. Every day, businesses make millions of phone calls and while call costs are often low, the accumulated cost to business is significant. For many companies, some of that cost is avoidable. They've long relied on private, leased-line networks to route their phone calls through, but rates applied to leased lines are often high. But there are now several attractive alternatives both to conventional public telephony and to leased lines. Among the most attractive are networking technologies based on a different kind of voice transmission, called packet voice. Packet voice appears to a network as 'data' and so it can be transported over networks normally reserved for data, where costs are often far less.

Packet voice data uses less bandwidth than conventional voice, so more can be carried on a given connection. While telephony requires as much as 64Kbits/sec of dedicated bandwidth per channel, packet voice often needs less than 10Kbits/sec. Many companies have sufficient slack bandwidth on their national and international data networks to transport considerable voice traffic, making voice essentially free.

For example, a Primary Rate ISDN connection from BT provides 30 lines. The same fibre can provide a 2MB connection to the Internet (30 lines each at 64Kbits/sec). A voice over IP system can transmit voice at 12Kbits/sec per 'line' and mix Internet usage and voice on the same pipe. So, in theory, you could have your 30 lines plus 1.5MB of Internet access down the same fibre you presently use for your voice system.

Voice and data have shared each other's networks for many years. Data over voice is, of course, the *de facto*



Cisco (top) is working with VocalTec (bottom) to develop a high degree of interoperability between their respective IP telephony systems

remote access method used by dial-up modems – voice over data has been common, using Frame Relay or statistical time-division multiplexing, but only for site-to-site work. As a result, most organisations typically have two separate physical networks for voice and data, increasing costs by duplicating staff, hardware and maintenance. This dual network approach has also limited their ability to take advantage of new applications that promise to revolutionise corporate telephony.

Packet voice data can be sent over any sort of network – IPX, for example – but most interest is focused on voice over IP or VoIP. IP isn't the best vehicle for voice traffic – it's weak, for example, when it

comes to guaranteeing quality of service. But IP enjoys many advantages. It's ubiquitous in public and private data networks and is supported by most hardware platforms. It has achieved this by being a true open standard, with unparalleled interoperability. It is also properly transport-independent – no other protocol is as easy or as cheap to deploy throughout an organisation.

Voice standards

Support for standards is crucial to the growth of the VoIP market. Of the dozens of VoIP products available now, only a handful support any standards-based implementation. The only standard with any notable presence is the ITU-T's Recommendation H.323, a version of the H.320 Multimedia-over-ISDN standard optimised for packet-based networks such as TCP/IP. Although H.323 is not specific to IP, it relies on some IETF technologies, most notably RTP (Real Time Protocol) and RTCP (Real Time Control Protocol), which were developed within the IETF's Multimedia Working Group.

H.323's modularity makes it extremely flexible, particularly for joining an existing voice network to VoIP equipment. Although only a small percentage of vendors support H.323, and imperfect though it is, it's your only guarantee of interoperability.

While H.323 is a great standard for multimedia traffic over ISDN, to many it is overkill for interactive voice tasks. Other, less complicated standards have been proposed for VoIP. One VoIP standard in the works is SIP (Session Initialisation Protocol). It is currently under development within the IETF's Multimedia Working Group, with a particular focus on IP implementation. SIP offers many of the same architectural features of H.323, but relies on IP-specific technologies, such as DNS, as well. It also incorporates the concept of fixed port numbers for all devices and



allows the use of proxy servers, both of which ease firewall implementation.

Another standard doing the rounds at the IETF is SGCP (Simple Gateway Control Protocol), which was developed by Bellcore. SGCP introduces a new call-management tier known as the Call Agent, which off loads much of the signalling intelligence from the end node.

Interoperability problems

Gateways or technologies from one vendor don't necessarily work with technology from another, which often forces users to seek a single-vendor solution. H.323 specifies mandatory support for the G.711 codec (also known as Pulse Code Modulation or PCM) a widely available codec used in many forms of digital telephony. But G.711 requires 64Kbits/sec of continuous bandwidth for every network 'end point'. On a full-duplex voice circuit, a single 64Kbits/sec feed suffices, but on a packet-switched network such as IP, 128Kbits/sec of bandwidth is required if two users are speaking simultaneously.

At the moment, in order to guarantee interoperability among different vendors' products you have to use G.711 everywhere and this means you must expect every call to consume 128Kbits/sec of continuous network bandwidth or else you have to source products from just one vendor. But there are moves to improve interoperability. For example, Cisco is working with VocalTec to develop a high degree of

Internet telephony

So far most VoIP systems have been installed using private network infrastructure, over private corporate intranets or virtual private networks. This is mainly due to the Internet's inherent unpredictability and unmanageability. The most challenging aspect of providing telephone-quality VoIP to online customer service is the fact that you can't control the Internet. The Internet is a collection of connected networks that

sends information dynamically, seldom using the same routes twice. Compare this to a traditional telephone system, which establishes a dedicated connection between two points. With a dedicated connection, all the data follows the same route, delivering performance that is consistent and predictable. Since all the traffic on the Internet shares the same connections, a consistent level of predictability is impossible.

With current Internet telephone applications, each endpoint sends voice data to the other endpoint. In some cases this works fine, such as when both users are geographically close to each other on the network. Too often, however, the traffic cannot flow reliably enough to enable a high-quality experience. Many Internet phone products are subject to the current state of the Internet and make no provisions for quality of service.

interoperability between their respective IP telephony systems.

If the voice network at your company's headquarters is anything like most large company's networks, the odds aren't great that you can run VoIP over your existing data network. The bandwidth and frame-forwarding requirements of a very large-scale VoIP deployment are likely to be too much for your data infrastructure. Both bandwidth and frame forwarding can foil even the most ambitious network design, mainly because of inconsistent codec

(coder/decoder) implementations in first-generation products. Different vendors use different codecs for low-bandwidth VoIP, so there isn't much hope for anything other than G.711 across vendor lines. With G.711 generating 64Kbits/sec of continuous traffic at each end when there is any sound, you're forced to plan for 128Kbits/sec of constant utilisation for every VoIP call.

Another problem is network congestion, an inevitable result of the high-utilisation levels engendered by widespread deployment of G.711. To deal effectively with the congestion, you need to implement prioritisation services at the physical, data-link and network layers of your enterprise network. This means using Fast Ethernet switches instead of hubs, and incorporating 802.1Q and 802.1p within your Ethernet switching fabric.



The Voice Over Networks coalition doesn't want any government involvement in VoIP

CONTACTS

Roger Gann welcomes your comments on the Networks column. Contact him via the PCW editorial office or email:

networks@pcw.co.uk

www.vocaltec.com Makers of Iphone and partner of many telecom firms

www.cisco.com Like all router companies, Cisco is heavily behind VoIP

www.von.org The Voice Over Networks pressure group

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BE CLEAR ABOUT SUPPORT AND WARRANTIES

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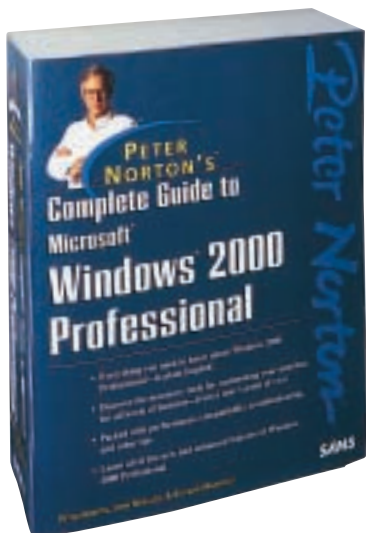
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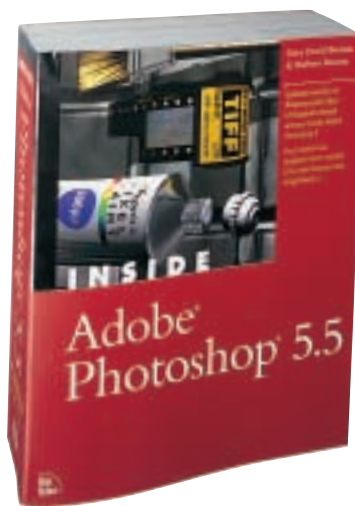
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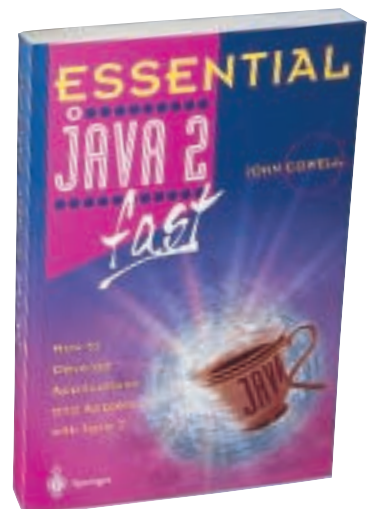
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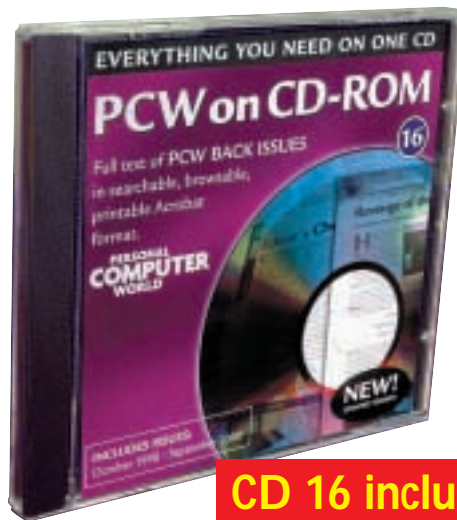
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Gunman Chronicles

If you've ever wanted to be a space cowboy you're about to get the chance, courtesy of Rewolf Software. Taking the Half-Life engine – developed by Valve Software – as its starting point, Rewolf has come up with Gunman Chronicles.

A first-person shooter, the game mixes science fiction with the Wild West, played out over 70 levels. Taking in four different planets, Gunman gives you a variety of environments to battle your way through. Death lurks around every corner – as well as in the skies – and, alongside a selection of human enemies, there's up to 30 alien life-forms bent on making your life difficult.

In your favour you'll have a choice of eight weapons with which to dispatch these foes. Each one is configurable, letting you program your firepower to meet the task in hand.

Starting off on the Uncharted Planet you find yourself dodging reptiles among the ruins of Mayan temples. Then, on the rusting Ferrin Moon, robots are your worst enemy. Giant scorpions and mean gunfighters populate the Western-styled planet Incus, while the final levels find



you roaming a mad scientist's underground lab. This mix of environments will demand varying styles of gameplay as you're required to stalk claustrophobic corridors on one planet, and then drive a tank across an open desert while being bombarded from the air on another.

If you're a fan of Half-Life, or first-person shooters in general, Gunman Chronicles promises an all-new game, building upon and enhancing the classic title. With such a good pedigree and the promise of some multiplayer options in the future, this is definitely worth a look when it's released in the New Year.

www.rewolfsoftware.com/gunman/
www.gunmanchronicles.com

ANDY STEWART

Mercedes Truck Racing

You've driven Rally cars, you've driven Formula 1 cars, you've even driven post-apocalyptic racing vehicles, but have you ever raced a truck? You would think that by comparison racing trucks would be a bit dull. Well, you'd be wrong.

This game is addictive racing fun. You race a five tonne, 12litre, 1,360BHP, twin-turbo racing truck, which is a wickedly fast, twitchy and difficult-to-control beast.

Throw into the mix up to seven



opponents and tracks from all over Europe and you have a game that is not only graphically rich (think Grand Prix 3 with trucks), but is extremely difficult to master.

The driving characteristics are, as you would expect, a little bit different to anything you'll have driven – although with no frame of reference for most

people, who's to know? The trucks have incredible power but are hard to get round corners. This makes the racing fast and furious, and with weather effects thrown in for good measure, you'll be truck racing for a while. Check out the screenshots at www.thq.co.uk. Search for Truck Racing.

SCOTT MONTGOMERY

Command & Conquer: Red Alert 2

The fast and furious RTS returns, this time to defend the US from the scourge of the Red Army

Alternate realities are always great for games developers. Last month we looked at *Crimson Skies* and its alternate United States. Westwood's sequel to its huge hit *Red Alert* goes further than messing with the history of only one country though, with the whole world totally reconfigured.

In *Red Alert*, Einstein travels back in time to assassinate Hitler and save the world from the atrocities of the Second World War – a seemingly good idea with some unforeseeable results.

Stalin, in the absence of Hitler's Nazi war machine, decides to expand the borders of the Soviet Union, taking advantage of the gap caused by the lack of any strong opposition in Western Europe. The Reds march to the Atlantic and it is your job to stop them.

Red Alert 2 (RA2) begins after this war. Stalin is dead and the Allies have installed a new premier Alexi Romanov as the leader of the Soviet Empire. RA2 begins when the US discovers the Soviets are launching a full-scale offensive on the North American mainland. The scene is set and now you must fight off the Red threat once again.

The game is in the real-time strategy (RTS) genre, and in RA2 the real time is pretty fast paced. The developers have



worked hard to make this an all-action game almost from the word go. Your troops and units move faster and build times are pretty quick, putting you in the thick of the action in no time at all.

The graphics in the game look excellent. As with the original, the buildings are animated, with satellite dishes rotating and bits of structures swinging around – we especially liked the Psychic Sensor, a fine-looking revolving antenna. The armoured units and troops also have more detail and move with more fluidity. Damaged buildings are rendered in amazing detail, showing tangled cabling and girders in their exposed innards. And, of course, there are all the buildings you'd expect to find in a battle ground in the US: the White House, the Statue of Liberty and the Pentagon to name but a few.

Tanya is still the Allied secret infantry weapon. Upgraded with an ability to swim, she is as deadly as ever. Rocket soldiers have also been added to the Allied arsenal, hovering above the ground with rocket packs. The Soviets have their equivalent to Tanya in Yuri who – you've guessed it – uses his mind powers to control enemy vehicles. And as for Soviet vehicles, the Kirov Airship is an excellent and stylish air weapon, ideally suited to the game's alternate reality.



The single-player campaign has the same cheesy, yet totally watchable, scenes with actors playing out the background to each mission, along with the animated cut scenes where units are deployed, that will put a big grin on your face before you even get into the game.

Tactical considerations have also been developed in RA2, with the tank rush now a thing of the past. Each unit has been carefully balanced so that even the strongest unit has its weaknesses. The result is a much more balanced play, with awareness of the enemy units your best defensive tactic.

Overall, *Red Alert 2* is fast, furious RTS action. If you liked the first, you'll love this. If you didn't play the first, buy it, and then buy this! The might of the Red Army must be stopped!

SCOTT MONTGOMERY



DETAILS

★★★★★

PRICE £29.99 inc VAT

CONTACT Electronic Arts 0870 243 2435

www.ea.com

SYSTEM REQUIREMENTS Pentium II 266; 64 MB of RAM; 2MB video card; four-speed CD-ROM; Direct Sound compatible sound card; Windows 95, 98, Me, 2000





Midtown Madness 2

Despite a disappointing single-player option this sequel's souped-up engine excels in multiplayer

For those of us who played the original Midtown Madness, the wait for the follow-up has been a lengthy one. The original involved racing various cars around Chicago against the computer or human opponents over the Internet or a LAN. The game was a breakthrough in the racing genre with the entire city of Chicago rendered, complete with traffic and pedestrians. This gave the effect of a Hollywood movie as you handbrake-turned through junctions while normal vehicles followed the Highway Code. It was, and is, an excellent game, providing hours of addictive gameplay.

Midtown Madness 2 is more of the same, although this time round you race in two new cities: London and San Francisco. Like the original, the cities are recreated in detail, with each existing in its entirety. This provides a huge number of potential routes between checkpoints – which can be taken in any order – and makes for some excellent racing. Or does it?

The problems come from two areas: the amount of damage your car can take has been increased hugely, while objects no longer stop you dead; and secondly, the courses don't have the same difficulty level of the Chicago tracks. For any Midtown Madness aficionados, the tracks will be won on a first or second

attempt – even at the Pro setting. In the original, you would find it hard to beat the AI cars while following the arrow. Instead, you had to find a route that would take you round the checkpoints faster than the default route. Now you can win simply by following the arrow between the checkpoints. In many races in MM2, when you pull away, that's the last you see of the other cars. You're all racing round the checkpoints in the same order; you just don't see them because they're behind you.

There's little need to find an alternative route because you're winning anyway.

Of course, there are some aspects that make the game enjoyable.

There are the Crash

Courses, which add a demanding slant to the game. Either driving a stunt car in San Francisco, or a taxi in London, you're set various hair-raising tasks. Some involve you doing the Speed (from the movie of the same name), where if you slow down to below the minimum speed you fail the mission. This makes you drive like a lunatic as you try to cover the checkpoints. Others are similar to Blitz Runs of the original, while the exams tend to be an amalgamation of the previous courses.

As with Midtown Madness, the multiplayer game is excellent. Once you have connected to the Microsoft Gaming

Zone on the Internet, and it has downloaded the software to your PC, you can race against human opponents. The Cops and Robbers game will bring the same wide smile to your face that the original did, and suddenly you can forgive the game's single-player failings. MM2 is excellent in multiplayer and it gives fans of the original what they wanted: more cities. Unfortunately, Chicago can't be imported as the whole engine has been upgraded (excellently, we might add – especially night-driving and rain effects), but with two new cities to race in, this can be overlooked.

With a graphics overhaul, the new cities and lots of new cars (complete with wing mirrors) to unlock, MM2 makes a fun and challenging racing game. The multiplayer is excellent, but without a single-player mode, this can't be a five-star game – although, online play will probably make it a hit.

SCOTT MONTGOMERY



DETAILS



PRICE £29.99 inc VAT

CONTACT Microsoft 0345 002 000

www.microsoft.com/games/midtown2

SYSTEM REQUIREMENTS Pentium II

300MHz; 32MB of RAM (64MB

recommended); 450MB hard disk space; four-

speed CD-ROM; DirectX 7.0a; Windows 95,

98, Me, 2000



Star Trek: New Worlds

Star Trek's first foray into strategy gaming fails to push back any frontiers

Star Trek: New Worlds is one of the first strategy games to be based on the *Star Trek* franchise, taking a new approach on a popular theme.

Initially, it looks impressive, with the story line beginning just after *Star Trek V: The Final Frontier*. You enter the story when the Romulans are about to try out their newly developed weapon, codenamed 'Project Shiva' in the 'Neutral Zone' – the buffer zone between the three main galactic powers: The Klingon Empire, the United Federation of Planets and the Romulan Star Empire.

As the story unfolds, the Romulan weapon test goes terribly wrong and a whole new star system appears from nowhere. The intro sequence is well made, whetting your appetite and making you eager to start playing.

Up to this point the game feels as trekkie as you would expect, with the familiar *Star Trek*-style music and effects. You are then launched into your missions via some excellent tactical briefings. They are all very detailed, giving you the necessary information for what to do.

As for the multiplayer option, the briefings become even more impressive as each player gets a rundown of their own goals as well as information on how to prevent opponents from achieving theirs. You also get an overview of the map area where play will occur and a 3D flyby of the general area in which your base is situated.

It's from here that the game starts to go downhill, offering very little to differentiate it from any other strategy games. In fact as strategy games go it's, unfortunately, not a very good one.

The first problem we encountered was that you couldn't move around using the 'Tricorder' overview map. Instead we had to scroll around with the cursor keys on the keyboard or with the mouse. This wouldn't have been too bad if it hadn't been for the scroll speed, which made it feel like slow motion.

While the graphics do have their appeal, they are far from excellent. These are rendered in full 3D and have three different viewing angles, although the

game feels a bit dated in comparison to games like *Ground Control* when it comes to the control system and playability. It's one of those games that could have been great, but didn't quite make the grade. It almost seems like the developers, Interplay, launched the game before the control system was finished. As such, the gameplay is awkward, making it very hard to grasp what is going on and where.

The 'Tricorder' acts as the overview map, but the way it has been implemented makes it virtually unusable. While it displays several areas in different coloured grids, all of them with different meanings – for example green is raw dillithium – the rest of the map is in a single-coloured grid with all the

buildings represented as small squares of the same colour.

This makes it really hard to figure out what is what as all your units are small squares the same colour as the map (or yellow or red depending on what 'alert' state they're in). There are three zoom modes on the 'Tricorder' map but this does little to help as things become harder to distinguish as you zoom out.

Ultimately, the game isn't all that bad, although it's let down by all the annoying quirks that shouldn't have made the final release. It differs very little from most strategy games with the exception that you usually have more than one goal to meet. However, even this presented problems. For instance, if you build an advanced mining facility rather than a standard one you can't finish a mission if the goals include building a standard mining facility!

Overall, there are a lot of things that aren't up to scratch with this game and it is very hard to recommend it because of its failings.

LARS-GORAN NILSSON

DETAILS

★★

PRICE £39.99 inc VAT

CONTACT Interplay 020 7551 0000

www.interplay.com

SYSTEM REQUIREMENTS PII 300MHz;

64MB of RAM; 400MB hard drive space;

16MB 3D accelerator; sound card; Windows

95 or 98

Combat Flight Simulator 2: WWII Pacific Theatre

Fight for control of the skies and relive past victories with this updated flying sim

A few years back, Microsoft finally got the message that people wanted to shoot at other planes in flight simulators, as well as navigate, take off, land and all the other things that flight simulators involve. And so, Combat Flight Simulator was born, taking you into battle over Europe in the Second World War.

As with all games though, this classic became dated: the lack of ground detail made it look a little blocky next to some of today's more graphically-rich titles. Until now, that is.

Combat Flight Simulator 2, like its predecessor, is an excellent WWII combat flight simulator. And along with a new theatre of operations it has

addressed the graphical issues that made the original feel outdated.

The flight characteristics of the aircraft are as realistic as ever, although the action is much faster than in the original game, which seems sluggish after playing the new version. The graphics have been tweaked, with the planes more detailed as are the ground and sea. Damage is excellent, with parts of the plane spewing flames where bullets hit – such as shot-up wings. Also, fuel tanks can explode spectacularly leaving a fairly intact yet crippled plane spiralling groundwards.

Aircraft carrier launches and landings have been put in as a fine addition to test your skill, and a new set of planes

specific to the Pacific theatre are available for you to fly. This is an excellent update of the original classic.

SCOTT MONTGOMERY

DETAILS

★★★★★

PRICE £24.99 inc VAT

CONTACT Microsoft 0345 002 000

www.microsoft.com/games/combat2

SYSTEM REQUIREMENTS Pentium 266MHz; 32MB of RAM (64MB for Windows 2000); four-speed CD-ROM or faster Super VGA; DirectX 7; 400MB hard disk space; API-compatible sound card with speakers or headphones for audio; Windows 95, 98, Me, 2000



Links 2001

Dust off your plus fours and your putter for some top golf action

But what is it like to play? The interface works very well with everything you need to know close at hand before you smack that drive or delicately chip it onto the green. In true Microsoft style most of the options are contained within menus covering aspects from club selection to camera angles – and a multitude of other options.

Lesson one: Hitting the ball. Well, put it this way; it's easy if you are used to these sort of games, difficult if it's your first time. Links 2001, like many golf sims, relies on the classic swing meter. You can choose to set the level to 'easy' where markers guide your swing, or you can set it to 'power stroke', where you had better get your timing and mouse control down to a tee. That's not all: to top everything off, Microsoft has included some new players, animations, courses and ball physics to add to the realism of tournament play.

There's also the Arnold Palmer

Course Designer allowing you to create your own courses, and the option to play online against opponents.

If you want to get as close as you can to the real game without having to leave the house or dress garishly, then Links 2001 promises to deliver.

JALAL WERFALLI

If you enjoy golf then this reworking of the famous Links golf game will be right up your fairway. Here at PCW we've played more than our fair share of rounds and we like what we see. With a new graphics engine the scenery is very realistic, covering vistas that include cliffs, lush foliage, arches and bunkers. Even the golfers have been anti-aliased for seamless transitions. Further improvements mean the maximum resolution has been bumped up to 1,280 x 1,024, while alpha-blending and bilinear filtering also help the image.

DETAILS

★★★★★

PRICE £28.99 inc VAT

CONTACT Microsoft 0345 002 000

www.microsoft.com/uk/games/links2001

SYSTEM REQUIREMENTS Pentium 266MHz or higher; 48MB of RAM (64MB recommended); 4MB graphics card (8MB and hardware acceleration recommended); 200MB hard disk space, (additional 550MB for APCD); four-speed CD-ROM; Windows 95, 98, 2000, Me; 28.8K modem or LAN for multiplayer





In the spirit of Christmas, PCW and Microsoft are giving three lucky winners the chance to unwrap the ultimate present for their PC; copies of Microsoft Windows 2000 Professional and Office 2000. A great bundle for businesses of all sizes, Microsoft's latest versions of its operating system and productivity suite will get everyone in the mood for holiday festivities with easy, enhanced user interfaces. Together they will make adding those extra seasonal touches to your documents and mail-outs a breeze.

With more wizards than ever before, adding any new software and hardware found under the tree will be even easier,

as will be configuring network and Internet connections. With Office 2000's enhanced features, the financial tools in Excel can be used to work out whether office budgets allow for a small treat or a big Christmas bonus, and when you're planning Christmas lunches, special voting buttons in Outlook's emailed invitations can be used to ensure special dietary needs are met.

Whether you're using Word or Outlook to create your party invitations, the mailmerge features in both makes preparing and sending them quick and easy, leaving you time to worry about more important things, such as

remembering to buy the extra port and stilton for Santa. If you would like more information on Microsoft Windows 2000 Professional and Office 2000 and where they can be purchased, call Microsoft on 0345 002 000 or visit the Microsoft website at www.microsoft.com.

■ For a chance to win one of three bundles of Microsoft Windows 2000 Professional and Office 2000, just answer this simple question and follow the 'How to enter' instructions on the opposite page.

What feature makes preparing and sending Christmas party invitations quick and easy in Word or Outlook?

PCW January 2001 Microsoft competition entry form

Name:

Email address:

Daytime telephone number:

Address:

Answer: The feature that makes preparing party invitations quick and easy in Word or Outlook is:

• Please tick here if you DO NOT want to receive information about other products and services from VNU Business Publications Ltd

• Please tick here if you DO want your details to be passed on to other carefully selected companies for marketing purposes

Iiyama/Eidos competition winners

The winners of November's bonanza competition are: S Harris of Sutton, J Reeves of Emsworth, Godfrey Thomas of Tottenham, Richard Joshua of High Wycombe and Chris Bretnerick of Leeds who all receive a copy of Eidos' Sydney 2000 game. T Brown of Eastbourne and Russell Skinner of Buckinghamshire both receive an Iiyama 15in LCD flat-panel monitor.

GREAT SOFTWARE AND A 1GHZ PC ARE UP FOR GRABS THIS MONTH

How to enter

Fill in the coupon(s) and send to the following address by 30 December 2000: January competition (NB PLEASE SPECIFY **MICROSOFT OR MESH**)
Personal Computer World
 VNU Business Publications,
 32-34 Broadwick Street,
 London W1A 2HG
 Or email your name, address and daytime telephone number to us at pcw_competition@vnu.co.uk

Please state in your email if you **DO NOT** wish to receive information about other products and services from VNU Business Publications Ltd, and if you **DO** want your details to be passed to other carefully selected companies for marketing purposes.

◆ Competition open to UK residents only

Rules of entry

This competition is open to UK readers of *Personal Computer World*, except for employees (and their families) of VNU Business Publications, Microsoft and Mesh. PCW is the sole judge of the competition, and his decision is final. No cash alternative is available in lieu of prizes.

Windows Me competition winners

The winners of November's competition are: Michael Browne of Woodbridge, M Parsons of Essex, M Sullivan of Kent, Bert Shimmin of Mold, David Pearson of Coseley, Robert Wick of Plymouth, S James of Newport, R Castle of Doncaster, Tom Parnell of London and G Houghton of Manchester. Each winner receives a copy of Windows Me.

The Mesh Matrix 1000MAX is a powerful and performance-oriented value system, part of the widely acclaimed Matrix range – winners of over 44 awards.

This leading-edge 1GHz system employs the latest in AMD Athlon processor technology and complements Mesh's range perfectly with ever-faster processing speed and performance for price conscious and demanding professionals and consumer users. Features of the system include a generous 19in monitor, 128MB of SDRAM, 30GB hard drive, modem, a 32MB nVidia GeForce2 MX Graphics card, 16-speed

DVD-ROM (40-speed CD-ROM) drive, Creative Soundblaster 128 sound card, four-point surround speakers, Microsoft Windows 98 Second Edition and Microsoft Work Suite 2000. There's also a three-year warranty, with the first year on-site. The 1000MAX is worth £1,291.33 inc VAT. More information on the Matrix range is available on 020 8208 4706 or at www.meshcomputers.com.

■ For a chance to win a Mesh Matrix 1000MAX, just answer this simple question and follow the 'How to enter' instructions. How many awards has the Mesh Matrix range won?



PCW January 2001 Mesh competition entry form

Name:

Email address:

Daytime telephone number:

Address:

Answer: The number of awards the Mesh Matrix range has won is:

- Please tick here if you DO NOT want to receive information about other products and services from VNU Business Publications Ltd
- Please tick here if you DO want your details to be passed on to other carefully selected companies for marketing purposes

Red, white and blue

Each cell of the square below is coloured – as you may have guessed from the title – either red, white or blue. Each row, each column and each of the two long diagonals contains exactly two cells of each colour. The information in each clue refers only to the cells in the row or column as indicated by the clue's letter or number. Can you use your logical powers to colour in the square?

Clues

- 1 The whites are adjacent
- 2 No two squares of the same colour are adjacent
- 3 The reds are between the whites
- 4 The whites are between the reds
- 5 No two squares of the the same colour are adjacent
- 6 The reds are between the whites
- A The whites are between the blues
- B The blues are between the reds
- C Each white is immediately above a blue
- D The blues are between the whites
- E The whites are between the blues
- F No two squares of the same colour are adjacent

Find the solution to this puzzle for a chance to win a copy of Microsoft Encarta Reference Suite 2001.

Send the answer, along with your name and an address where you would like the prize to be mailed, on a postcard to: PCWPrize Puzzle (January 2001), VNU House, 32-34 Broadwick Street, London W1A 2HG, or by email to: letters@pcw.co.uk.

Answers should arrive no later than 20 December 2000. Please note that we DO NOT open attachments.



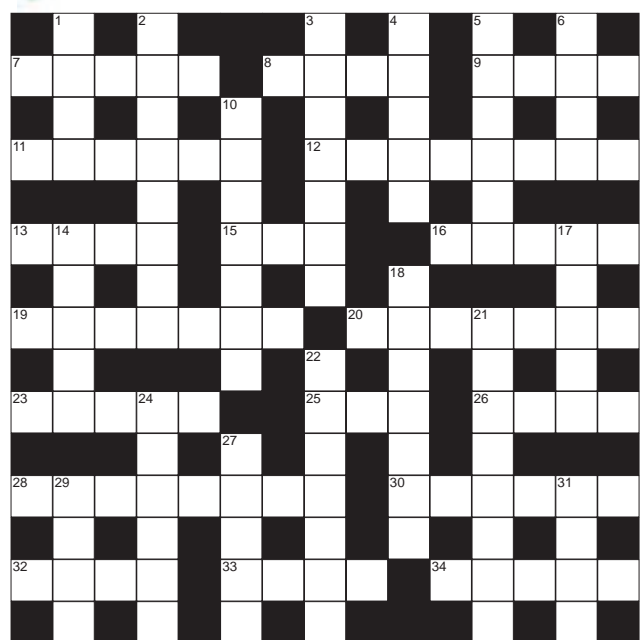
October's Prize Puzzle answer

The solution to October's puzzle is below. Congratulations to this month's winner, W Lanceloy of Bristol.

| No | Driver | Item | Recipient | Time |
|----|--------|-----------|-----------|-------|
| 1 | Pete | camera | Clark | 11.30 |
| 2 | Arthur | CDs | Gould | 10.30 |
| 3 | Fred | chocs | Redmond | 8.30 |
| 4 | Bill | hamper | Black | 11.00 |
| 5 | Dick | clock | White | 8.00 |
| 6 | Sid | jewellery | Brown | 9.30 |
| 7 | Jim | flowers | Smith | 7.30 |
| 8 | Harry | book | Jones | 9.00 |
| 9 | Don | chair | Green | 10.00 |

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |

prize crossword



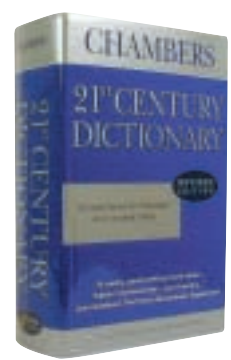
- 20 Group representing a single character (4,3)
- 23 Slow, unwanted change (5)
- 25 BASIC command returning whole numbers (3)
- 26 Current measures (4)
- 28 Updating a database, e.g. (8)
- 30 Now the ENTER key (6)
- 32 Means of passing audiotape copies (4)
- 33 Repeatedly executed set of statements (4)
- 34 Early valve computer (5)

DOWN

- 1 Apartement or useles tyre (4)
- 2 Ship's cabin window (8)
- 3 Sideways view (3,4)
- 4 Fool, dolt (5)
- 5 Instrument needing some pluck? (6)
- 6 Eager (4)
- 10 Housing areas (7)
- 14 Pavarotti, e.g. (5)
- 17 Tea-partying animal? (5)
- 18 Old-fashioned light (7)
- 21 Modifying (8)
- 22 A monarchical state (7)
- 24 Typing digit (6)
- 27 Large house (5)
- 29 Most important (4)
- 31 __ rage, motorway madness (4)

ACROSS

- 7 1950s structured programming language (5)
- 8 Spreadsheet's layout (4)
- 9 Mac __, PC hater? (4)
- 11 Present condition of computing elements (6)
- 12 __ - point notation, numerical format (8)
- 13 Quintillionth (prefix) (4)
- 15 Internet access provider (1,1,1)
- 16 Observe a program's operation (5)
- 19 Inputted information (7)



Each month, one lucky PCW Crossword entrant wins a copy of the Chambers 21st Century Dictionary. The winner of the November crossword puzzle is: Vance McDowell of East Sussex.

This time, it could be you. Send your completed crossword to: 'PCW January - Prize Crossword', VNU House, 32-34 Broadwick Street, London W1A 2HG, to arrive no later than 20 December 2000. Please state clearly on your entry if you do not wish to receive promotional material from other companies.

Solutions to December's crossword

- ACROSS**
 7 Seats 8 Wide 9 Amps 11Altair 12 Deselect 13 Hash 15 WWW 16 Sysop 19 Binding 20 Emulate 23 Unzip 25 Ion 26 Goto 28 Template 30 Search 32 Disc 33 Spur 34 Digit
- DOWN**
 1 Heel 2 Attached 3 Sit Down 4 Beast 5 Fawly 6 Epic 10 Brewing 14 Alien 17 Octet 18 Amongst 21 Log Cabin 22 Hideous 24 Impact 27 Balsa 29 Enid 31 Clip

Remember those heady days when a PC cost £8,500 and Word for Windows 1.1 was released?

20 YEARS AGO January 1981



This month's issue ran with the cover lines 'The bland leading the blind? Secrets of business computer buying.' This pointed to an article by Lyn Antill discussing the

decision-making processes you should go through before buying. She went on to describe how to deal with salespeople and engineers and their well-rehearsed patter. The overall advice was to decide which questions you really want answered and to stick with them, while increasing your know-how by reading *PCW*.

For those enthusiasts with the quintessential train set in the loft, Jeff Barton gave the ins and outs of the micro-controlled train layout that was part of his research into real-time control applications. Differing from the commercial sets that were available, his controlled the powered tracks rather than the trains. An MSI 6800 microprocessor operated the 10 x 5ft track layout through an interface that came with built-in collision avoidance and the means to generate automatic routes.

Further on, David Levy took a peek at poker and explained in some depth an algorithm for the card game. This was based on a system for estimating the probability that the opponent's downward facing card is of a certain denomination. The probabilities involved were adjusted according to information gleaned from the way the opponent bet during the hand – bluffing and poor play factors were also added to the algorithm. One has to question whether David was ever permitted to enter a casino?

15 YEARS AGO January 1986



PCW was as hot as ever – and this time quite literally. Not only had we won the 1985 UK Press Award for Computer Journal of the Year, but the cover was awash with flames

heralding Torch's attempt to bring Unix to the masses with its Triple X. Was Torch playing with fire? Inside Peter Bright found an 8MHz Motorola 68010 processor, 1MB of RAM, a 20MB hard disk, X25 and Ethernet, all running under Unix and Torch's user-friendly interface,

Opentop. At £3,995, Peter considered the Triple X to be good value in comparison with other Unix systems. If you wanted a communications/network system for non-technical staff, the Triple X was apparently a good choice.

Reporting from Las Vegas Comdex, Guy Kewney described a loss of confidence in the micro industry with the number of exhibitors and visitors down from the previous year's record. If this wasn't enough to dampen proceedings the main conference speech was titled 'Surviving the Industry Downturn'. Out of the exhibitors, Atari was the only home market manufacturer, and Cauzin Systems demonstrated its new superbarcode system called Softstrip. This barcode strip and infra-red reader could be used to transfer programs from paper into a computer.

While things were looking up for *PCW* the same couldn't be said for the US computer magazine market. David Ahl brought us the news that Creative Computing, the first personal computing magazine in the world, was killed off by its parent company Ziff Davis.

10 YEARS AGO January 1991



The IBM PS/2 Model 90 was *PCW*'s cover story, introducing readers to Big Blue's second 486 desktop to enter the market. Sold for the astonishing price of £8,500, the

Model 90 came with a 25MHz CPU and 160MB hard disk. *PCW*'s Guy Swarbrick felt that even with IBM's new Micro Channel Architecture, there were still plenty of other desktops available with standard Super VGA cards that were faster and much less expensive.

In our 'Long Term Test Report', Simon Rockman gave us his views on Microsoft's Word for Windows 1.1. His main complaint was its propensity for saving changes to files using the name of the person running the program not the original author of the document. He also found that other programs on his machine unnecessarily looked for files on a disk that he had previously used for Word documents – a problem that, 10 years down the line, still happens quite often. Despite these reservations, Simon found the program to be easy to use and very capable of desktop publishing.

Before the Sony PlayStation and Sega

Dreamcast, the Japanese company SNK produced the Neo-Geo – a games console that outshone its rivals in terms of power and graphics. However, if you thought the soon-to-be-released PlayStation 2 was expensive, the Neo-Geo sold for £350, with its games priced at £180 each. Basing his predictions on these ludicrous prices, Chris Cain correctly foresaw that the Neo-Geo wouldn't do well in the UK.

5 YEARS AGO January 1996



This month saw 120MHz Pentium systems on test. With the prices of the review systems ranging from £1,886 to £2,704, the Editor's Choice went to the Dan Dantum

95/s 120MM. The Dan was singled out for being well built and having ample room for upgrades. Highly Commended awards also went to the Evolution 2000 built by Olympian, and to the Viglen Ultimate M'Media 120PC for having some of the highest specs.

On the operating system front, Microsoft claimed that seven million copies of Windows 95, had been sold in the two months following its launch. And our testers bit the bullet and upgraded to Windows 95 for the group test.

Elsewhere *PCW*'s Simon Rockman didn't look upon LCD monitors, particularly the Compel Opti, too favourably. He claimed it was a 'waste of money and space', contradicting the marketeers' hopes that the public would see them as stylish space-savers. Unfortunately for Compel, Simon thought the 10.4in display with 640 x 480 resolution was too small for daily use.

Before Richard Branson decided to help us pick our poisons with Virgin Wine, a whole host of electronic booze guides on CD-ROMs, disks and shareware programs was available to sift through. In 'Tippie Tattle', Paul Begg, perused such programs and gave his highest rating (five wine glasses) to Microsoft's Wine Guide. This was a virtual encyclopaedia on everything plonk related, including the history of wine, an A-Z, and a glossary – perfect for ensuring the right wine was served with the Christmas dinner.

JANET HEIL AND JALAL WERFALLI

Apple Macintosh

Legend – or myth – has it that the birth of a Star inspired Apple's revolutionary Macintosh

Legend has it that, in return for 1,000 shares, Apple was given the right to browse around Xerox's famous Palo Alto Research Center (PARC). There Steve Jobs, along with a group of techies, apparently found inspiration for the Apple Macintosh.

The ground-breaking Xerox Star computer they saw featured a small external device to control the position of the on-screen cursor, and a remarkable user interface, where windows and icons graphically described and provided navigation around the system. The story goes that Jobs believed he had seen the future and wanted it for himself. However, the Star carried a price tag of around \$50,000, which further inspired Jobs to create a more affordable personal version.

The memoirs of Jef Raskin, leader of the Mac team until shortly before launch, tell a different story, however. Apparently in 1979, flush with Apple II profit and funds from an impending IPO, three new computers were proposed. The first would be the ill-fated Apple III, essentially an upgraded Apple II. The second would be the technically uncompromised high-end Lisa, standing for Locally Integrated Software Architecture, but also coincidentally the name of Jobs' daughter. The third should have been a home games machine, until Raskin apparently counter-proposed a general-purpose low-cost computer, based on ideas he'd had for a graphical user interface as far back as the late 1960s.

Raskin himself had visited PARC some time before becoming an employee at Apple. He claims that he tried to convince both Steves – Jobs and Wozniak – to visit PARC, but that Jobs dismissed the idea that Xerox could come up with anything revolutionary.

Later, Jobs was apparently 'tricked' into visiting PARC with Apple techie Bill Atkinson who, despite officially being on the Lisa team, had been secretly working with Raskin on the Macintosh project for some time. With months of research already behind them, it was no wonder the visiting Apple team asked all the right questions.

But whether or not you actually believe Raskin's story, the Jobs legend, or even argue that the Xerox Star in fact bore little resemblance to the Mac it was said to inspire, the fact remains that Apple was on its way to producing arguably the most revolutionary personal computer in history.

Raskin later fell out with Jobs and found himself removed from the Macintosh project, which Jobs took over. Jobs wanted the Mac to be as revolutionary physically as it was technically, so he hired Jerry Mannock, designer of the Apple II, to come up with a design good enough to get into the Museum of Modern Art. When Jobs saw Mannock's small upright box which almost smiled with its floppy drive, he knew he was onto a winner – but how should it be launched?

Apple was already using one of the hottest ad agencies around, which had access to British film director Ridley Scott (*Alien*, *Bladerunner* and the famous Hovis advert). Once Scott learned that the Macintosh was to be launched in 1984 to a market dominated by the faceless IBM, he immediately knew what had to be done.

His result was the award-winning commercial where a female athlete ran

through the nightmare land of George Orwell's *1984* and swung a sledgehammer through a projection of Big Brother. Remarkably, this commercial was shown only once, during the third-quarter broadcast of the Los Angeles Raiders vs Washington Redskins Super Bowl. The production cost \$500,000, but the prime advertising placement weighed in at a cool million.

It paid off. Tens of millions of Americans saw the commercial, which made news headlines the world over. The Macintosh had arrived to save the world from the conformist corporate nightmare of Big Blue IBM.

Whatever the inspiration behind the Mac, it was genuinely the first affordable personal computer to feature a graphical user interface. The technology was forward-thinking, too, featuring a Motorola 68000 CPU running at 8MHz – almost double that of the IBM PC. The upright, fairly luggable case featured a 9in, 512 x 342 pixel monochrome display and was the first computer to employ Sony's brand-new 3.5in floppy drive. The standard 128KB memory soon became too restrictive however, with a 512KB 'Big Mac' version arriving by the end of 1984.

In 1985, the advent of PostScript and PageMaker sealed Apple's close relationship with desktop publishing and graphics arts – a bond that remains to this day. Two years after the Mac's debut came the Mac Plus, pictured here, boasting greater expansion and a SCSI interface. In 1987 the Mac SE arrived, with Apple's innovative daisy-chained ADB interface and an optional hard disk.

By the early 1990s, the upright Macintosh form factor had been almost entirely superseded by the more serious Mac II systems, leaving the various Mac Classics to finally wrap up the all-in-one legend. Ironically, a single-box system would once more save Apple's bacon with the launch of the iMac in the late 1990s, but the memory of the original Macintosh still lives on.

In the closing words of that single advert: 'On January 24, Apple Computer will introduce Macintosh. 1984 won't be like 1984.'



Apple's compact Mac Plus had a GUI and a SCSI interface

GORDON LAING